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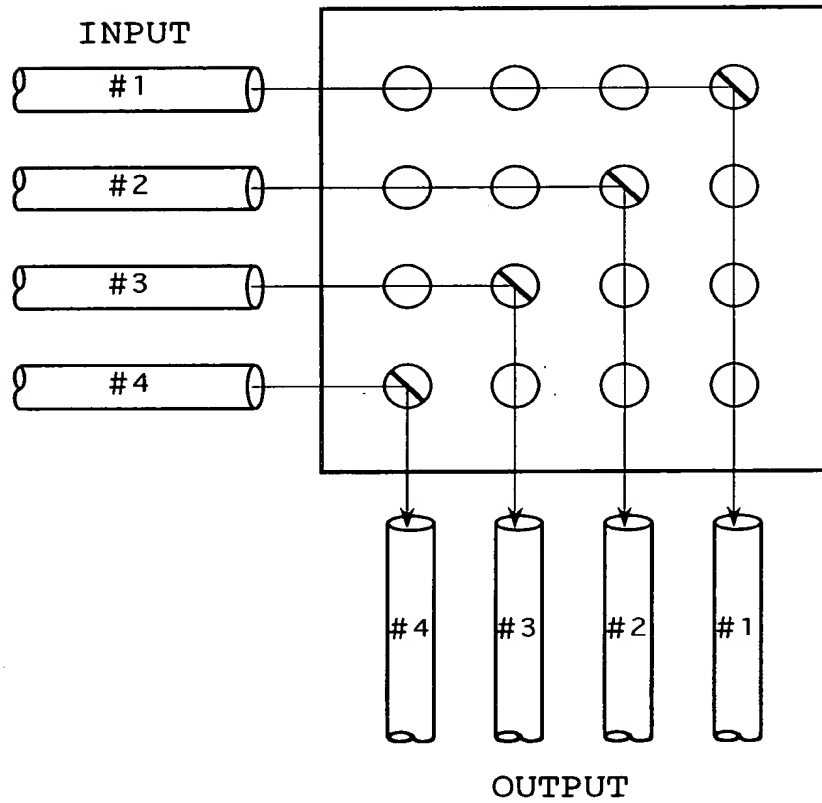
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# FIG.1

## PRIOR ART



- ⊗ ; SWITCH CELL (ON STATE; MIRROR INSERTED)
- ; SWITCH CELL (OFF STATE; MIRROR NOT INSERTED)

09924606-000901

0994606 080901  
106080" 90912660

# FIG.2

## PRIOR ART

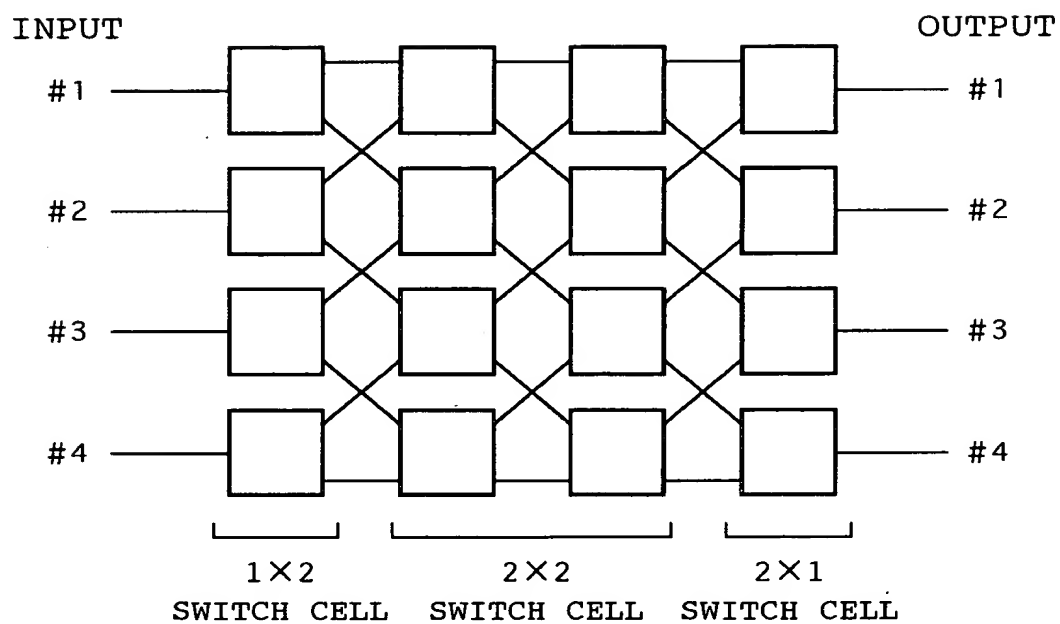
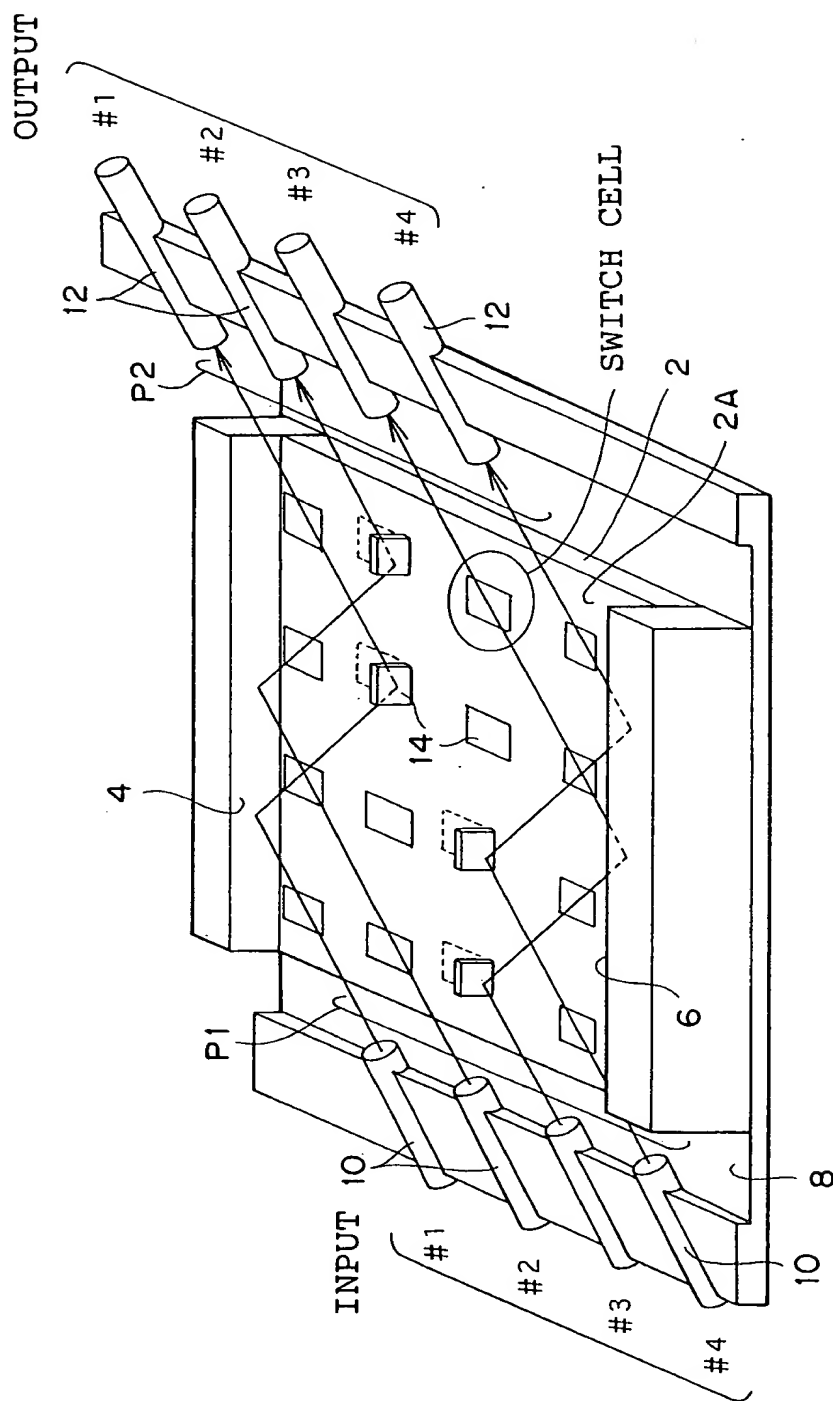
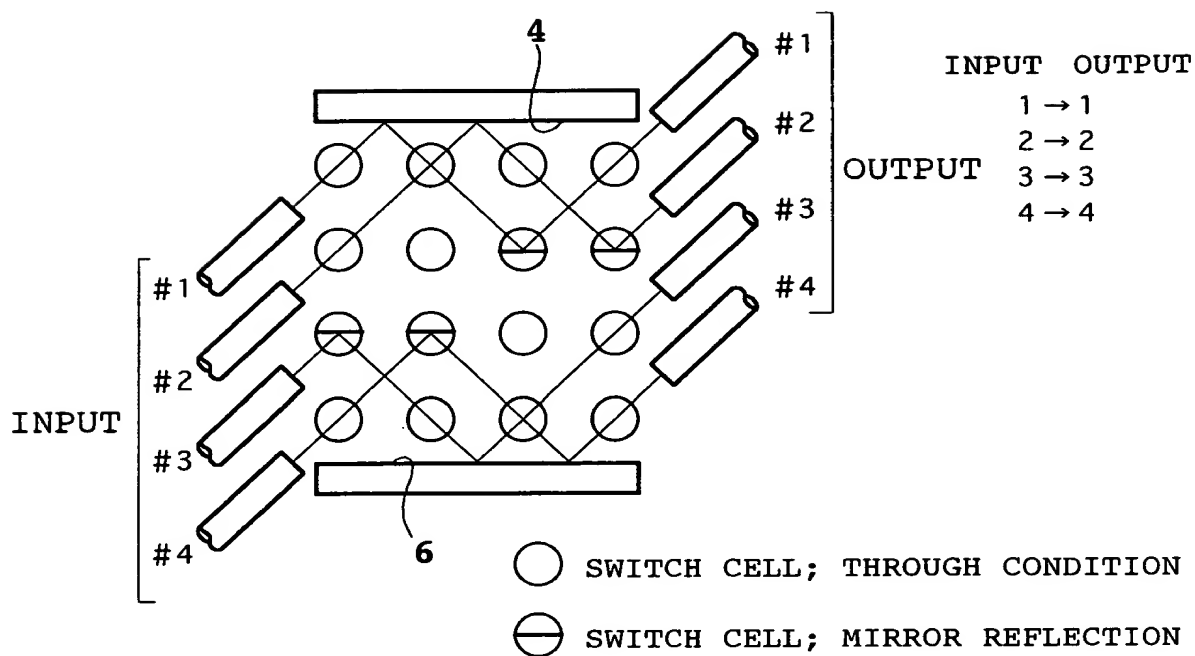


FIG. 3



# FIG. 4A



# FIG. 4B

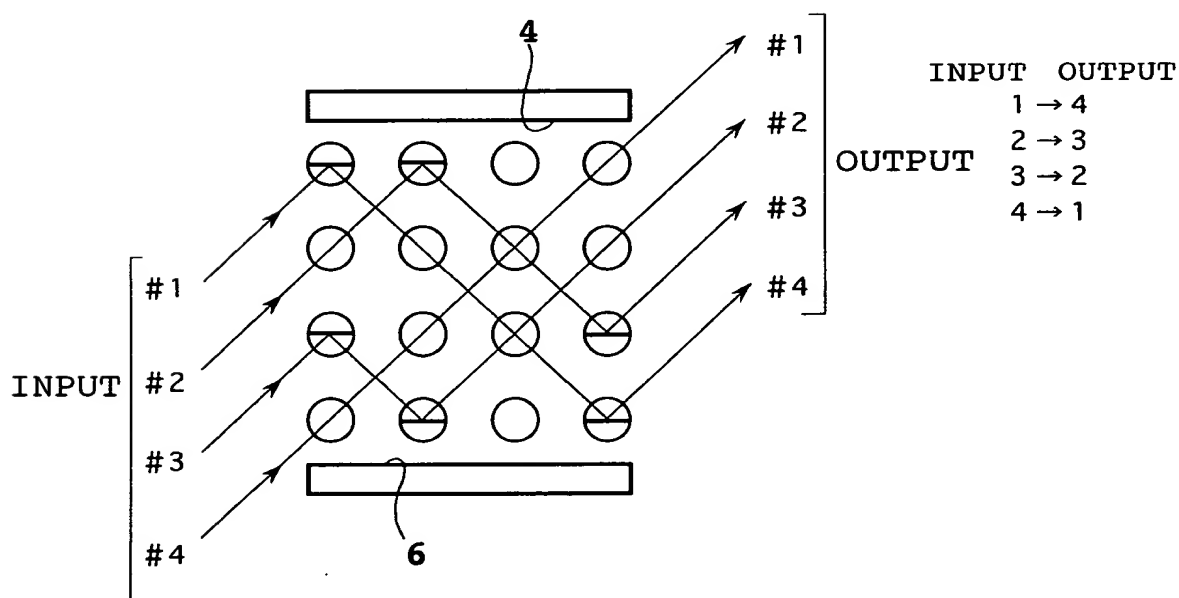


FIG. 5

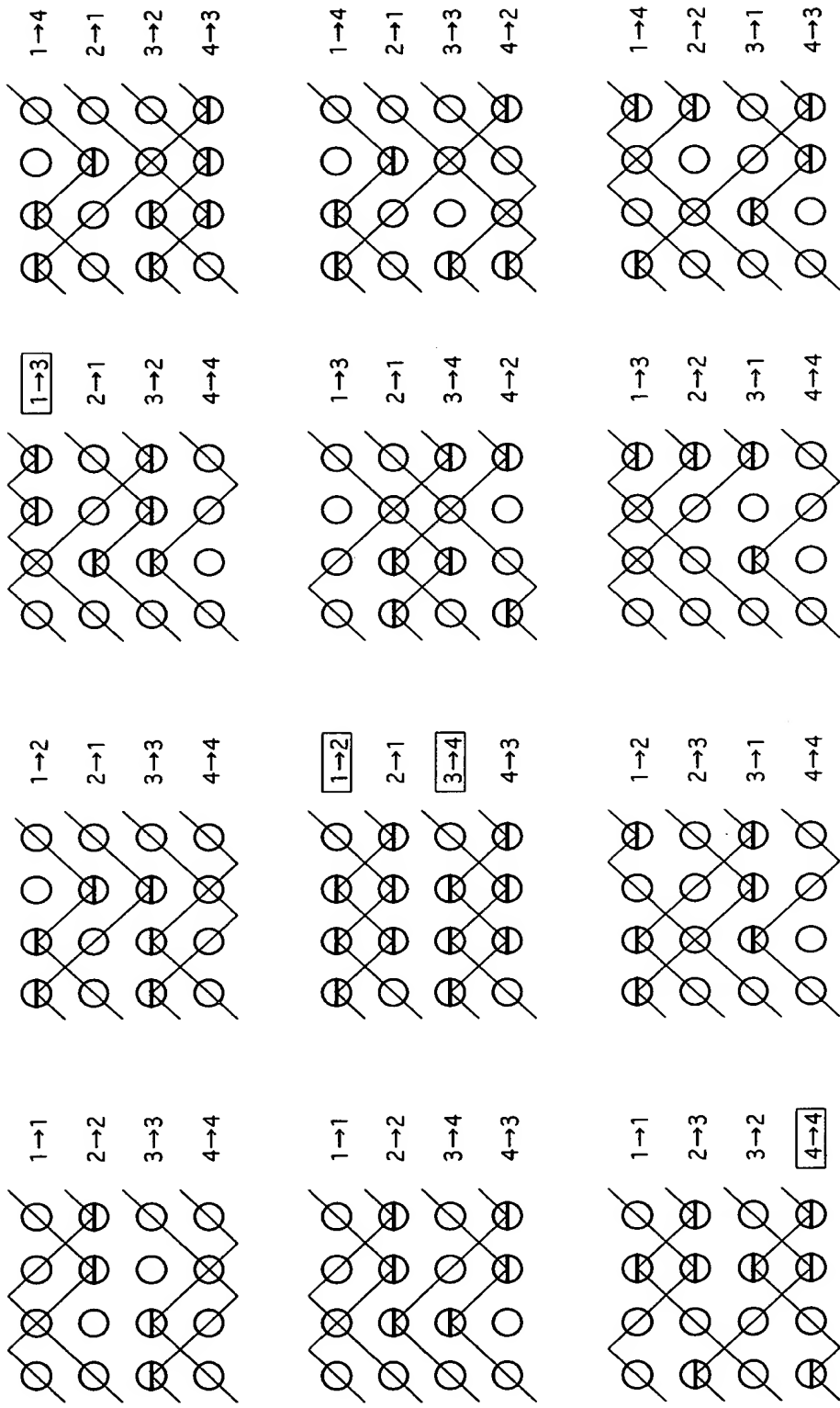
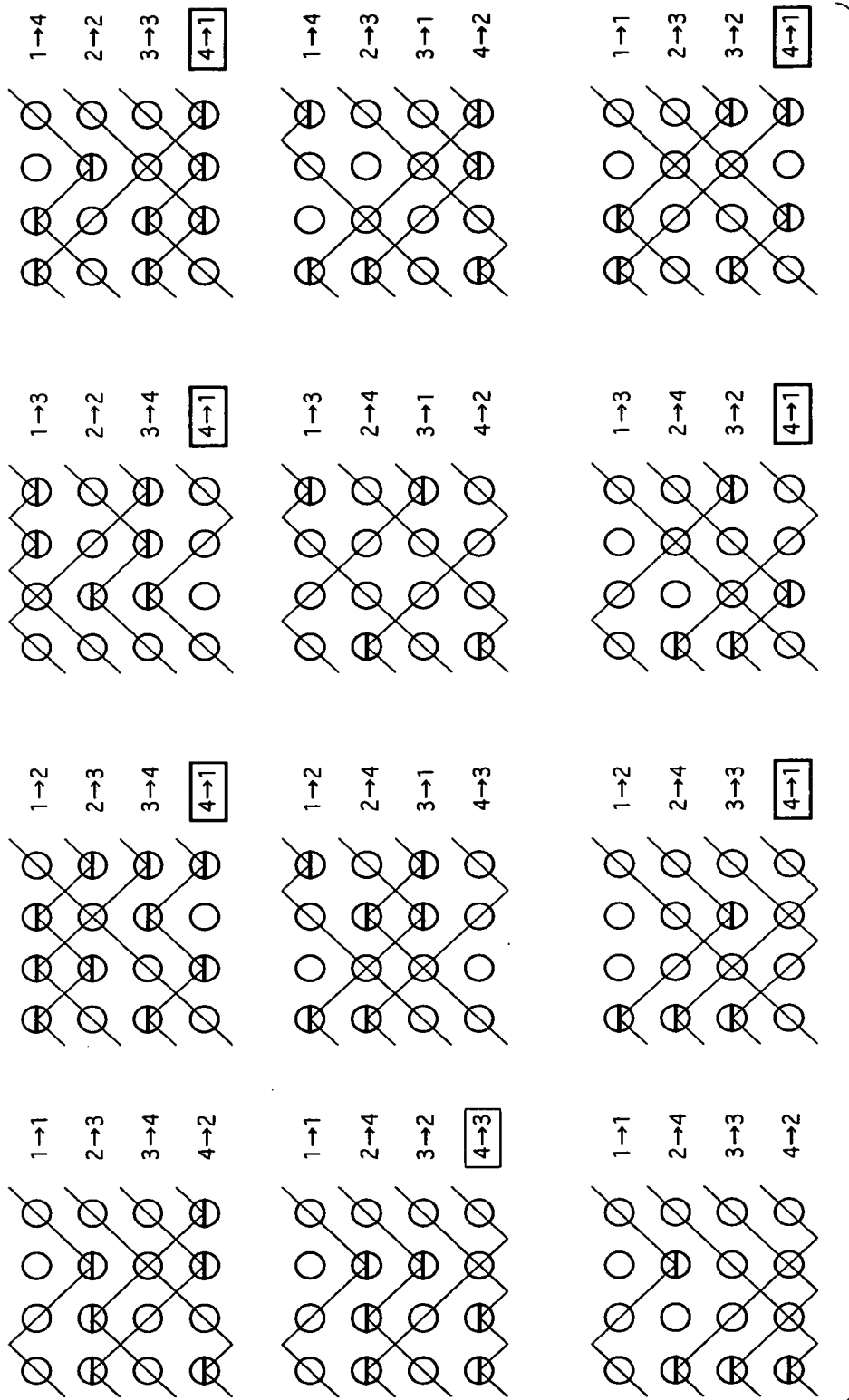
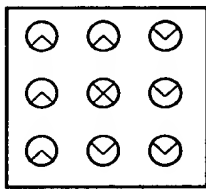
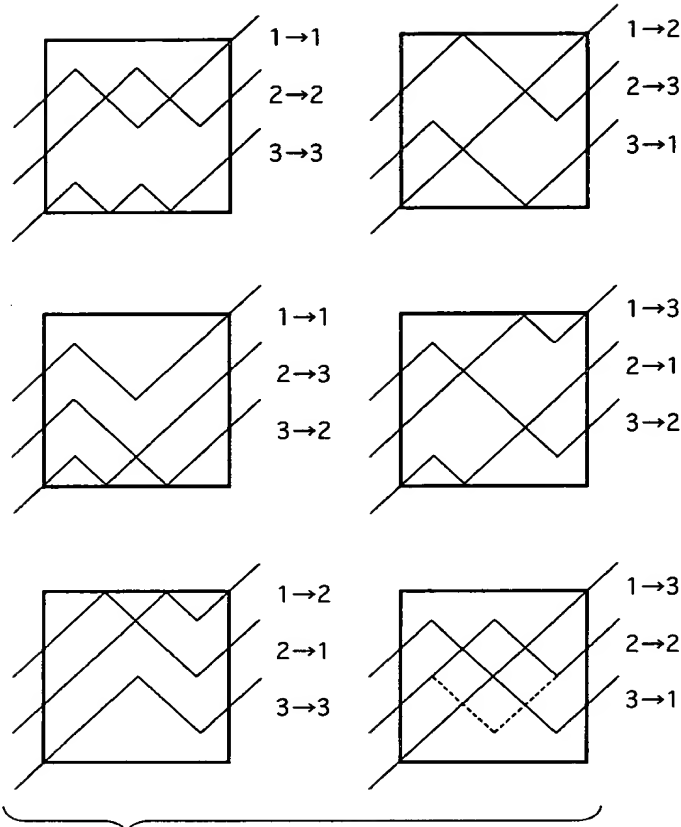


FIG. 6



⊗	⊗	⊗	⊗	SIZE; 4 x 4
⊗	⊗	⊗	⊗	NUMBER OF CELLS; 16
⊗	⊗	⊗	⊗	OPTICAL PATH LENGTH; 4
⊗	⊗	⊗	⊗	NUMBER OF REFLECTIONS; 2/4/0
⊗	⊗	⊗	⊗	KINDS OF MIRRORS; DOWNWARD REFLECTION; 5
⊗	⊗	⊗	⊗	UPWARD REFLECTION; 5
⊗	⊗	⊗	⊗	BIDIRECTIONAL REFLECTION; 6

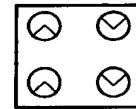
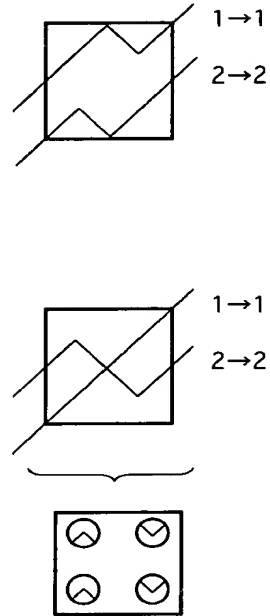
# FIG.7A



SIZE;3 x 3  
 OPTICAL PATH LENGTH ;3  
 NUMBER OF REFLECTIONS;2/4/0  
 KINDS OF MIRRORS;UPWARD REFLECTIN;4  
 DOWNWARD REFLECTION;4  
 BIDIRECTIONAL REFLECTION;1  
 NUMBER OF CELLS;9

**3 x 3 OPTICAL SWITCH**

# FIG.7B

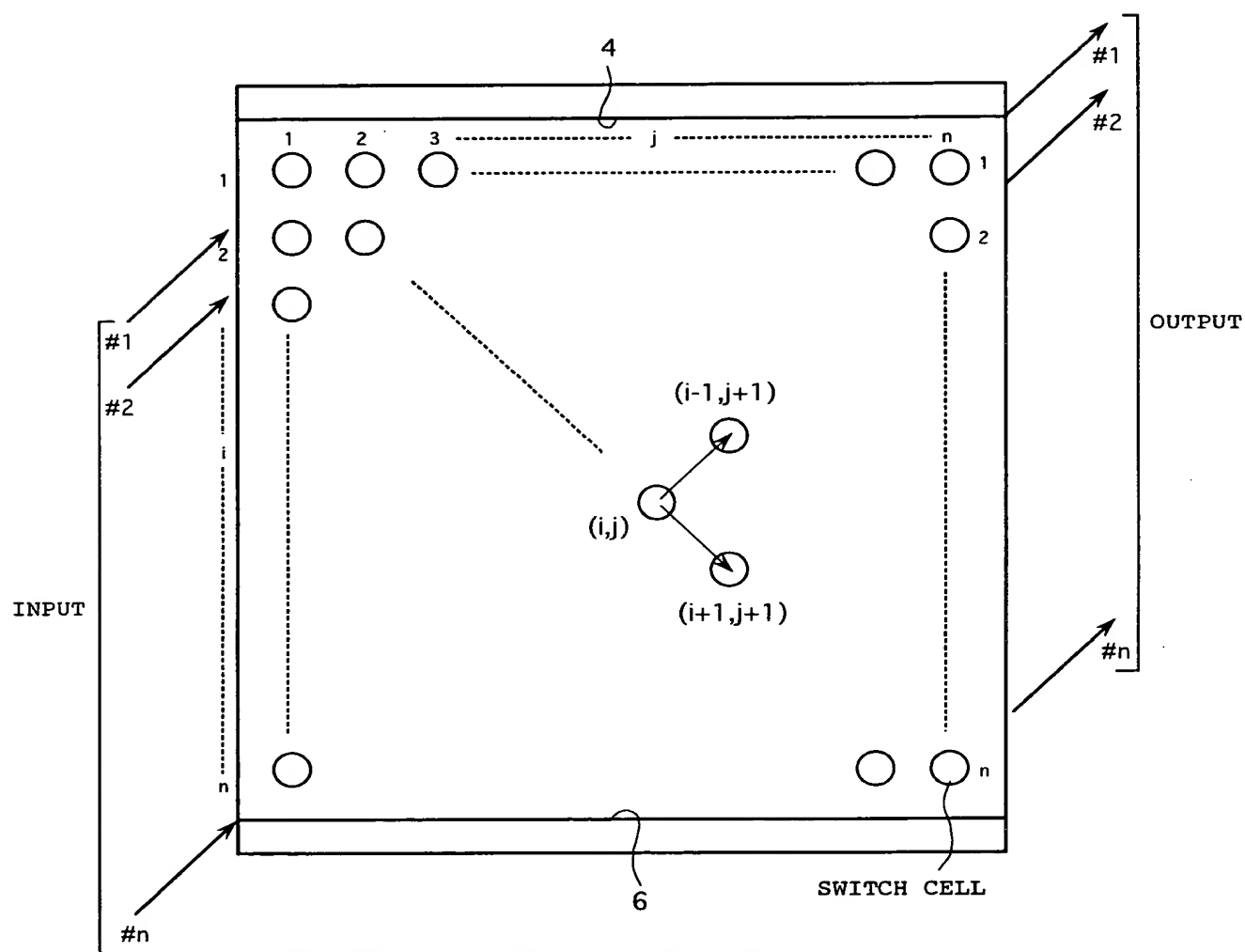


SIZE;2 x 2  
 OPTICAL PATH LENGTH ;2  
 NUMBER OF REFLECTIONS;2/1  
 KINDS OF MIRRORS;UPWARD REFLECTIN;2  
 DOWNWARD REFLECTION;2  
 NUMBER OF CELLS;4

**2 x 2 OPTICAL SWITCH**



# FIG.8



NUMBER OF SWITCH CELLIS;

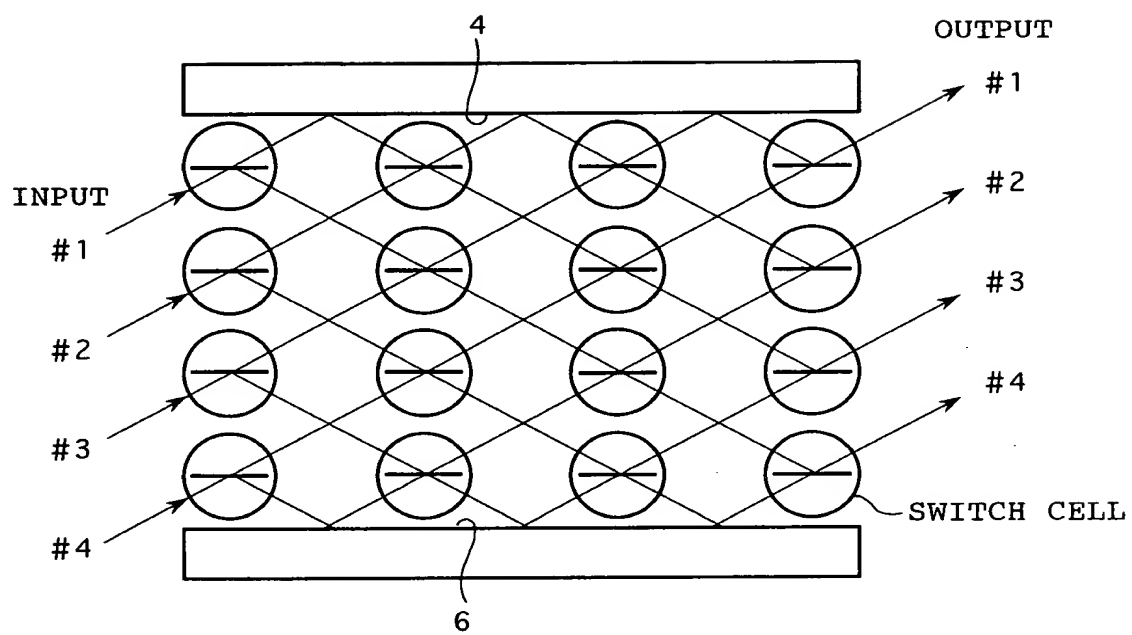
UPWARD REFLECTION;  $n+1$

DOWNWARD REFLECTION;  $n+1$

BIDIRECTIONAL REFLECTION;  $n^2-2n-2$

TOTAL NUMBER;  $n^2$

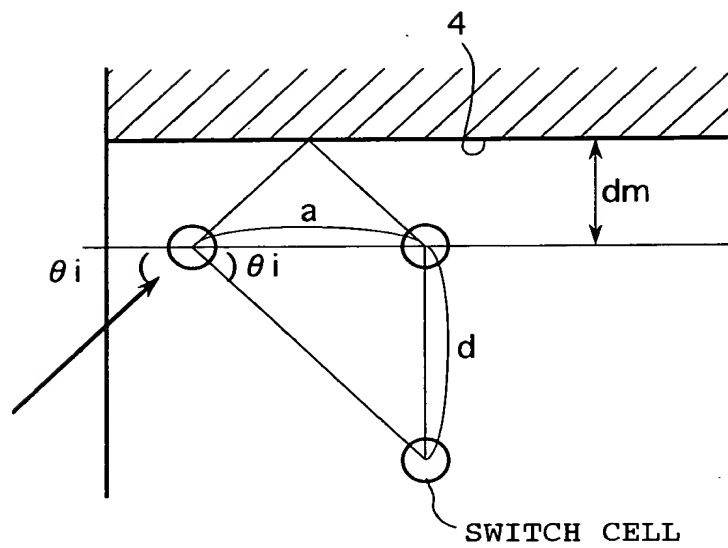
FIG.9



ANGLE OF INCIDENCE;  $30^\circ$

09924606-080901

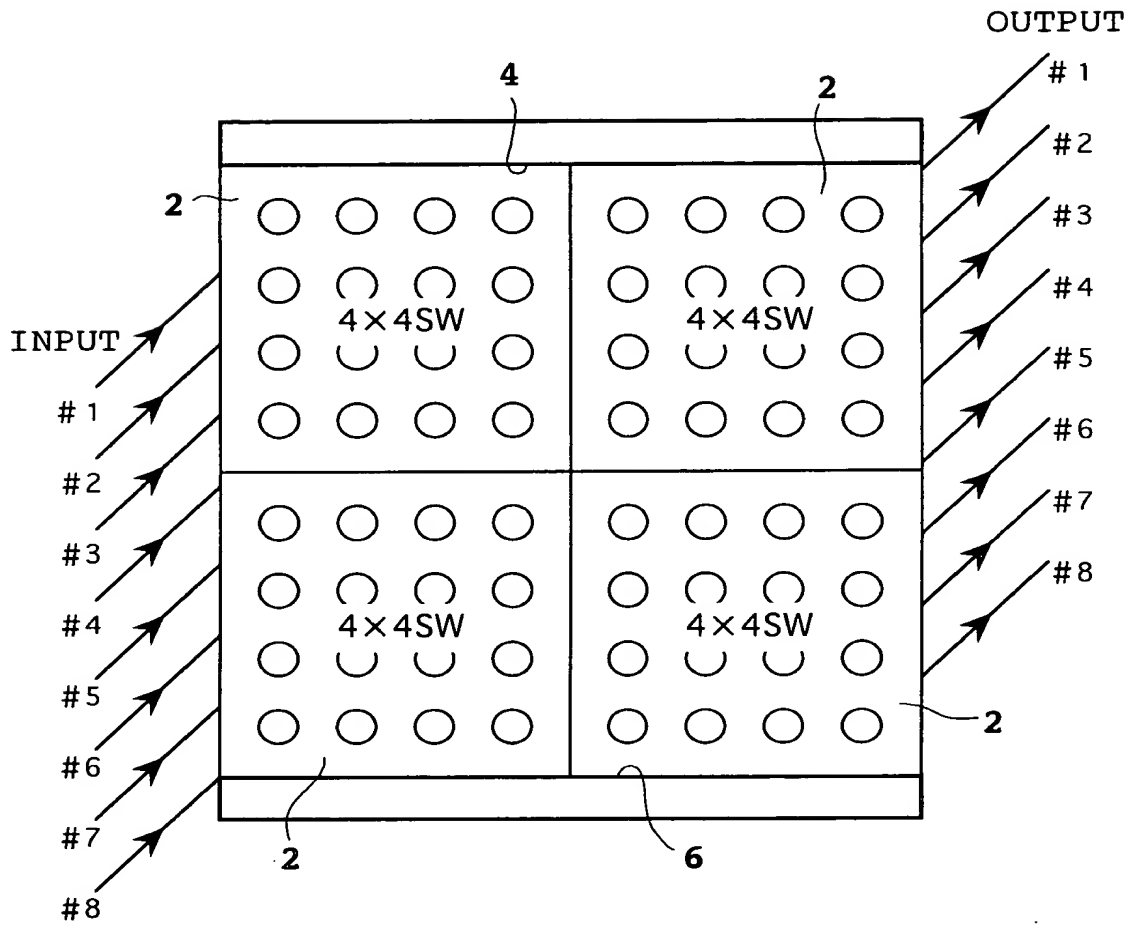
# FIG.10



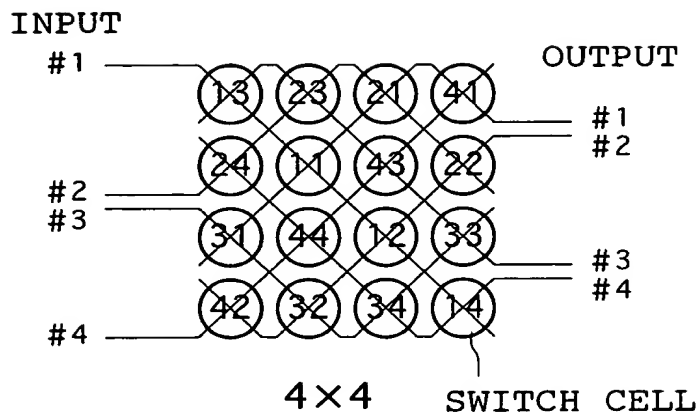
$$d = a \cdot \tan \theta_i$$

$$dm = 1/2 \cdot a \cdot \tan \theta_i$$

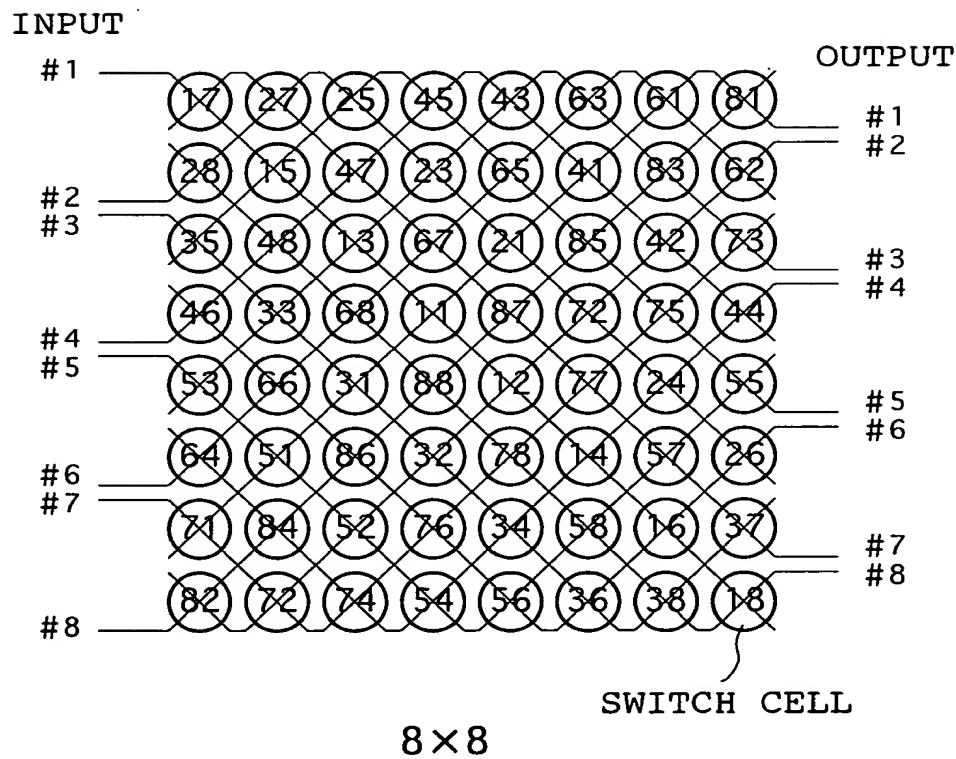
FIG. 11



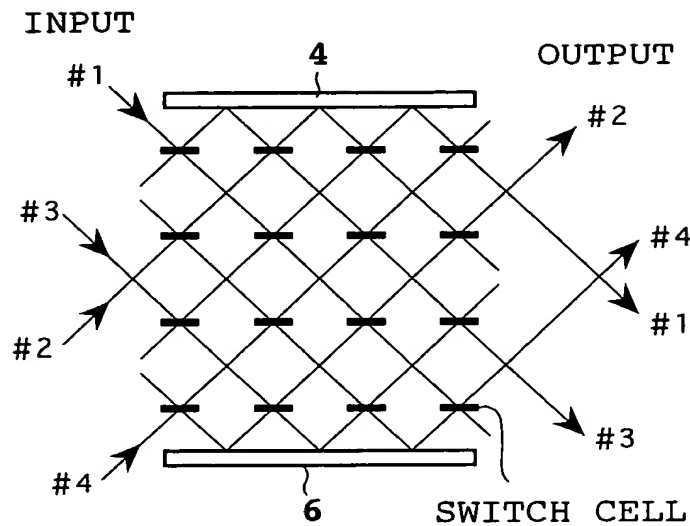
# FIG.12A



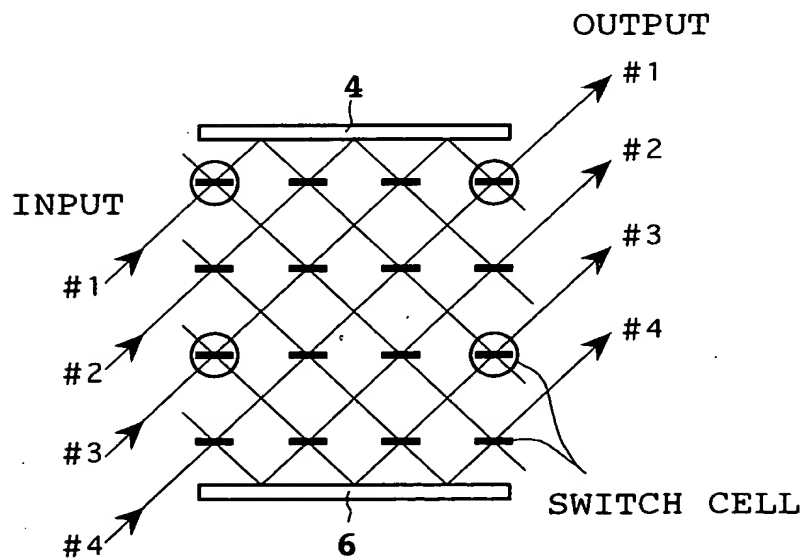
# FIG.12B



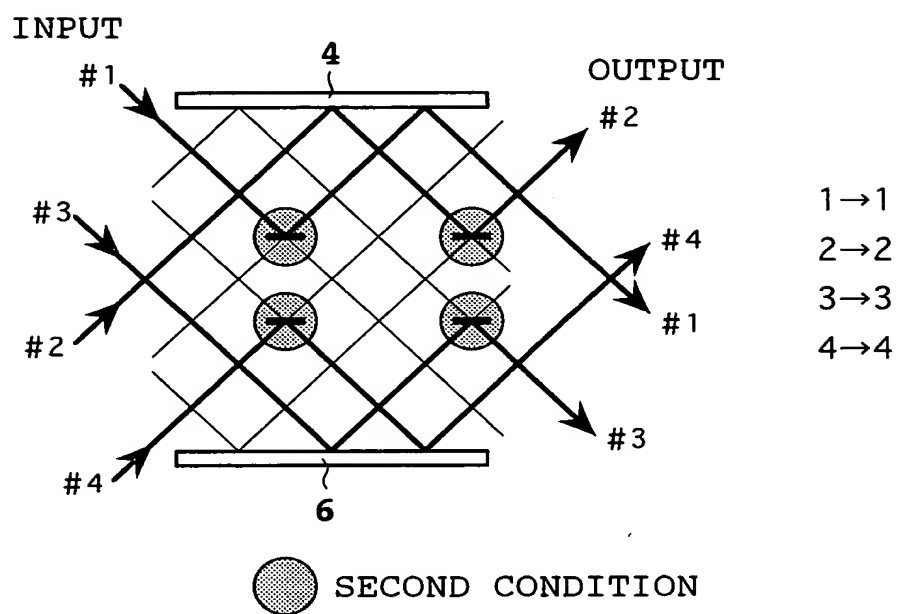
# FIG.13A



# FIG.13B



# FIG.1 4A



# FIG.1 4B

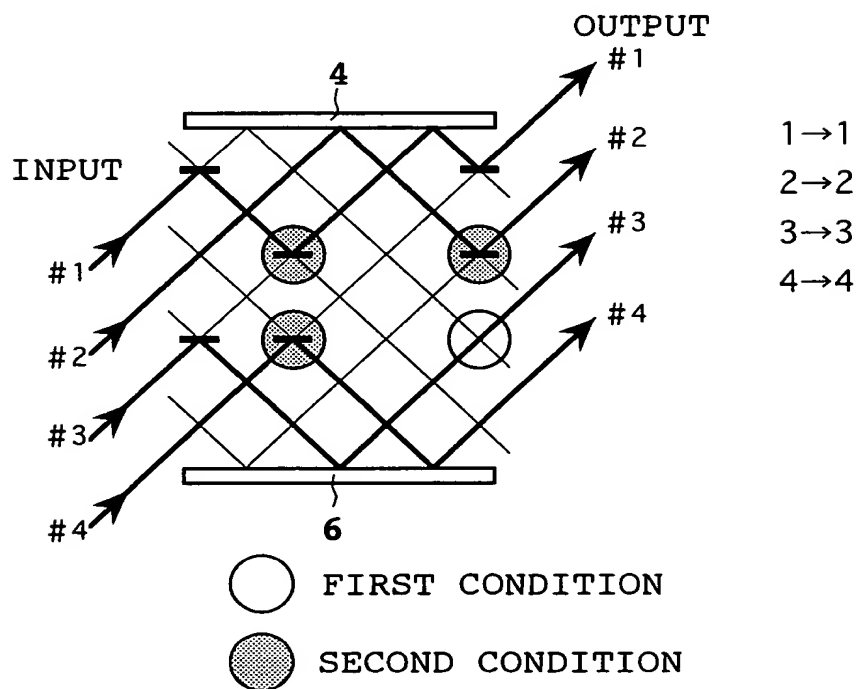


FIG.15

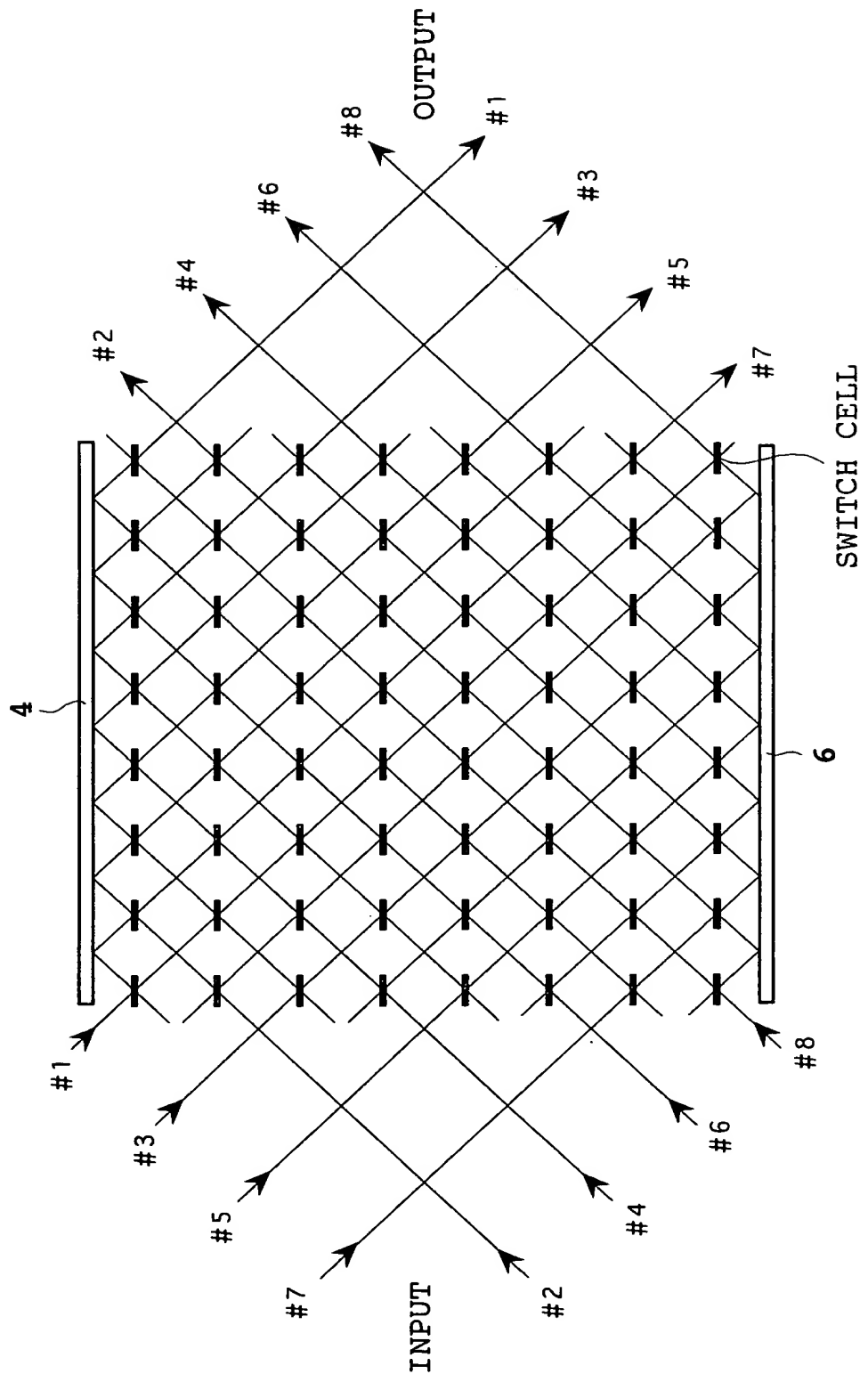
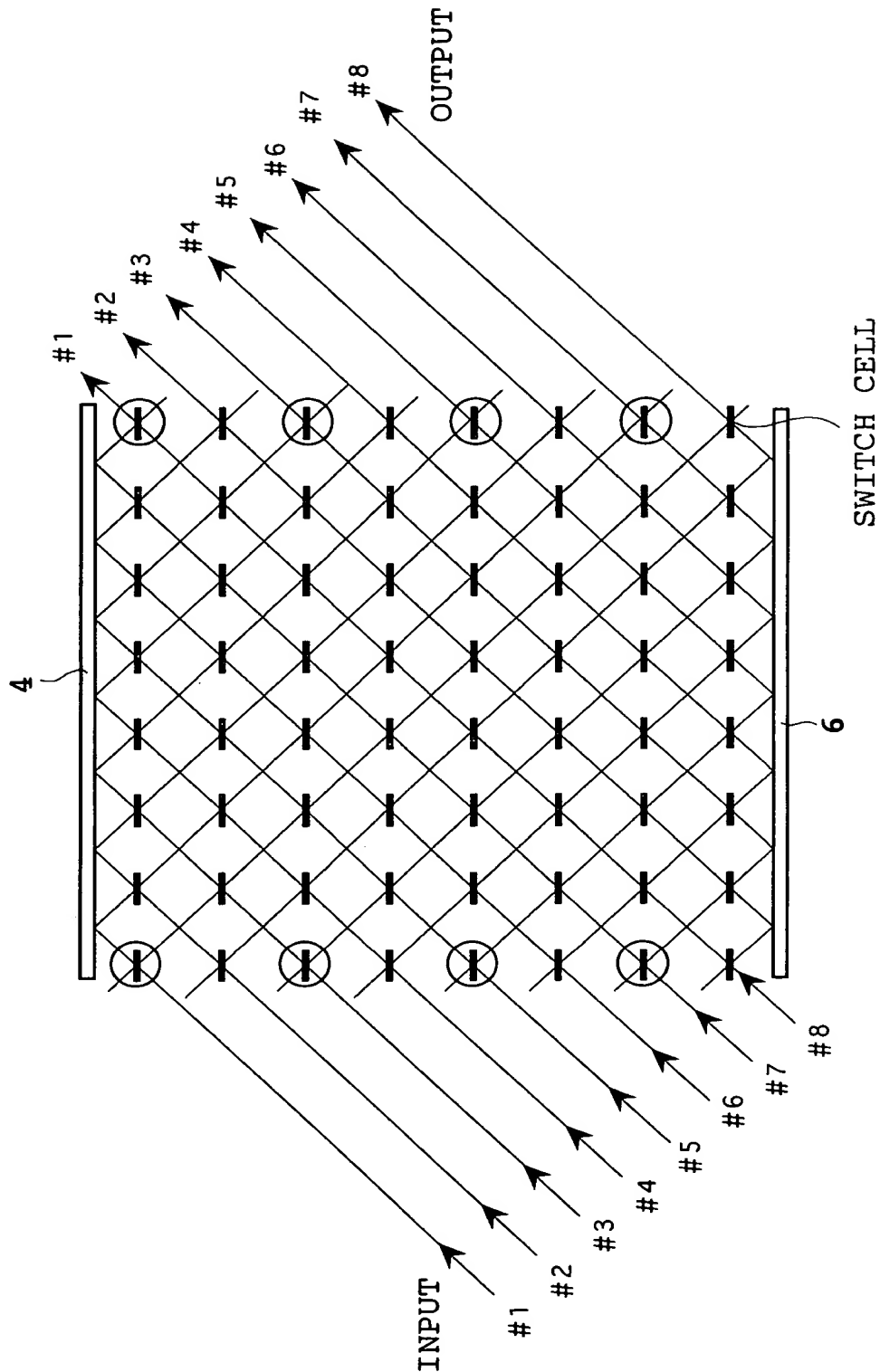
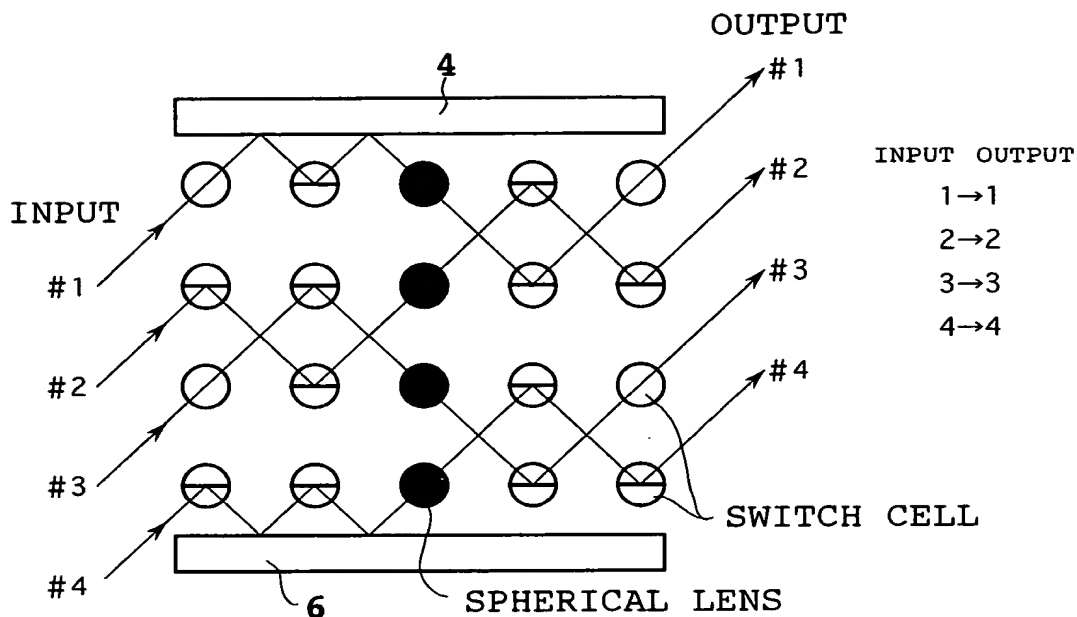




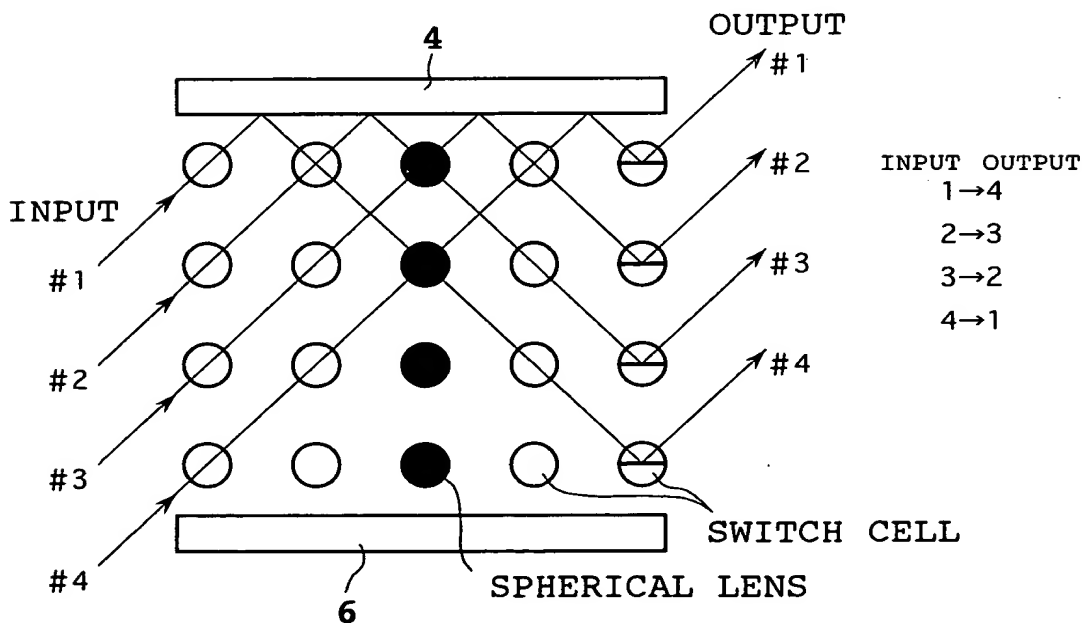
FIG.16



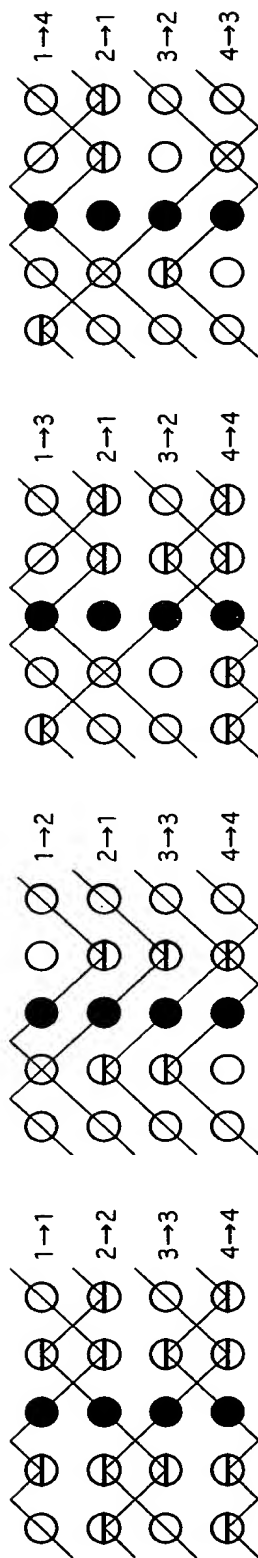
# FIG.17A



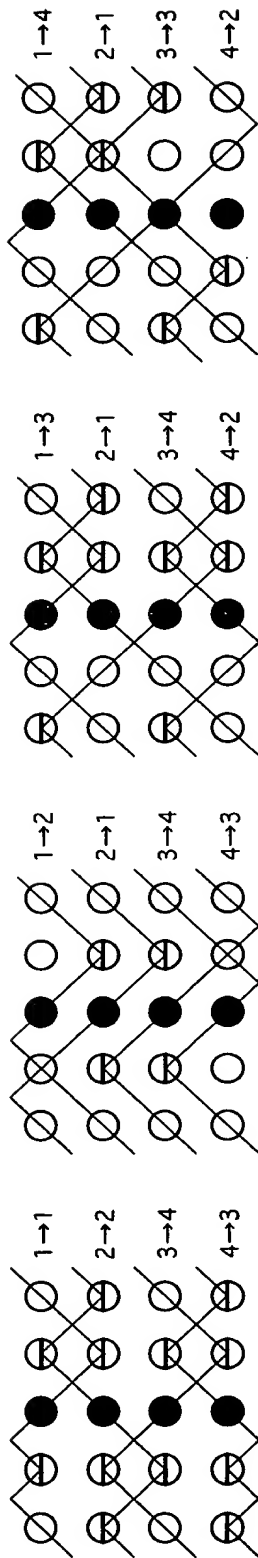
# FIG.17B



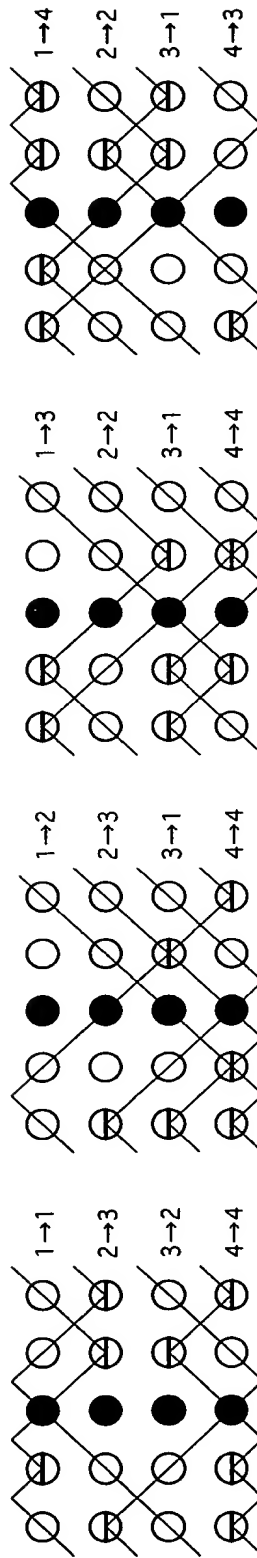
# FIG. 18



SIMULTANEOUS BIDIRECTIONAL REFLECTION; ONE CELL



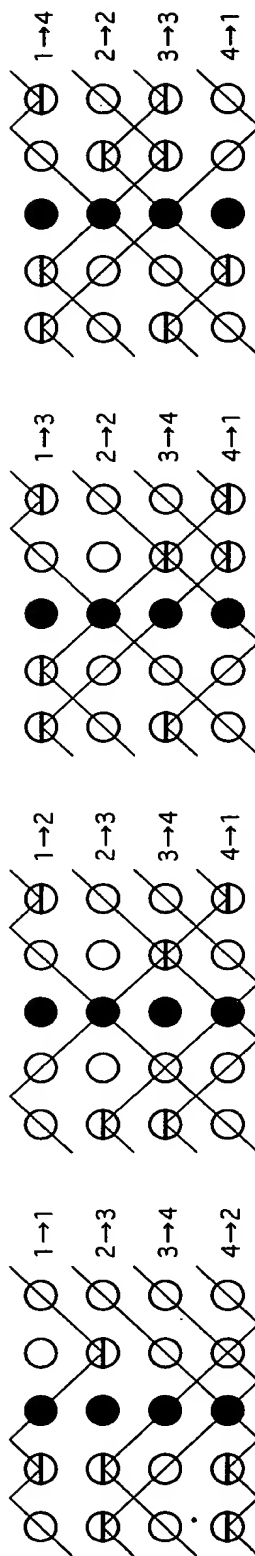
SIMULTANEOUS BIDIRECTIONAL REFLECTION; ONE CELL



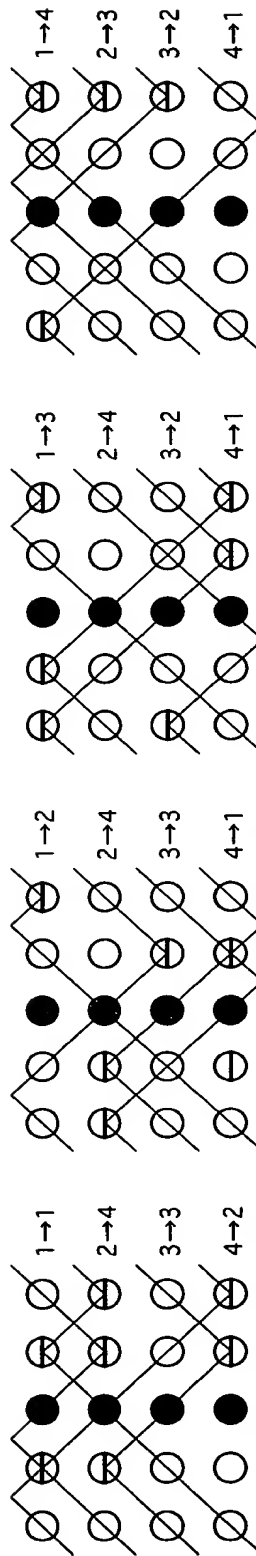
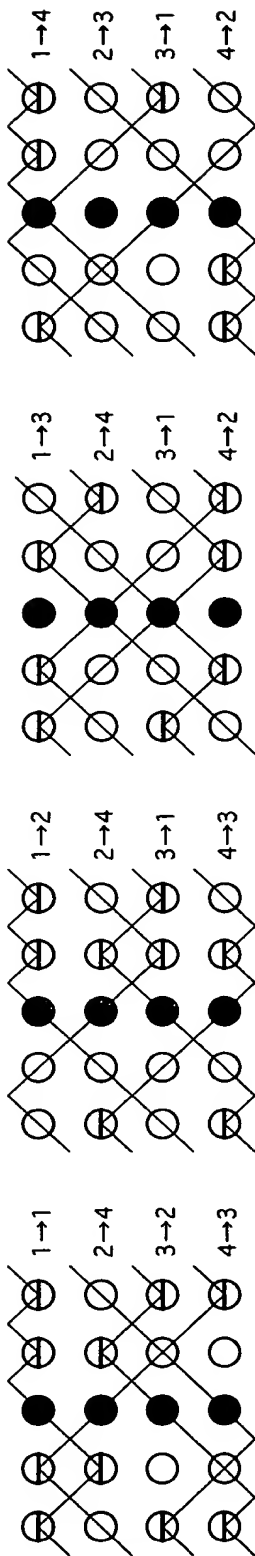
SIMULTANEOUS BIDIRECTIONAL REFLECTION; TWO CELLS

SIMULTANEOUS BIDIRECTIONAL REFLECTION; ONE CELL

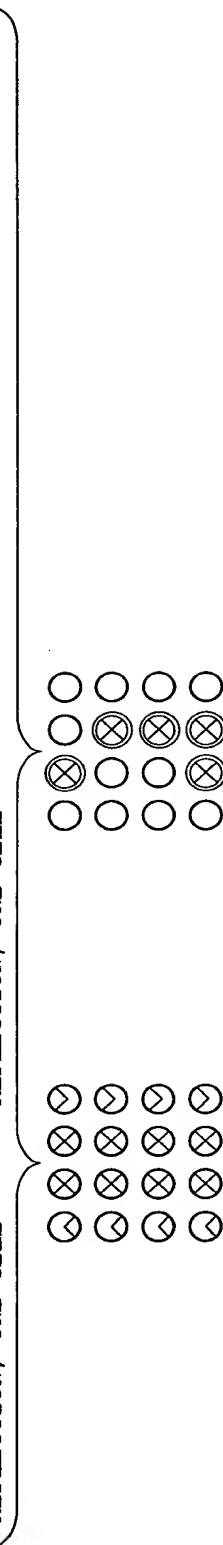
# FIG. 19



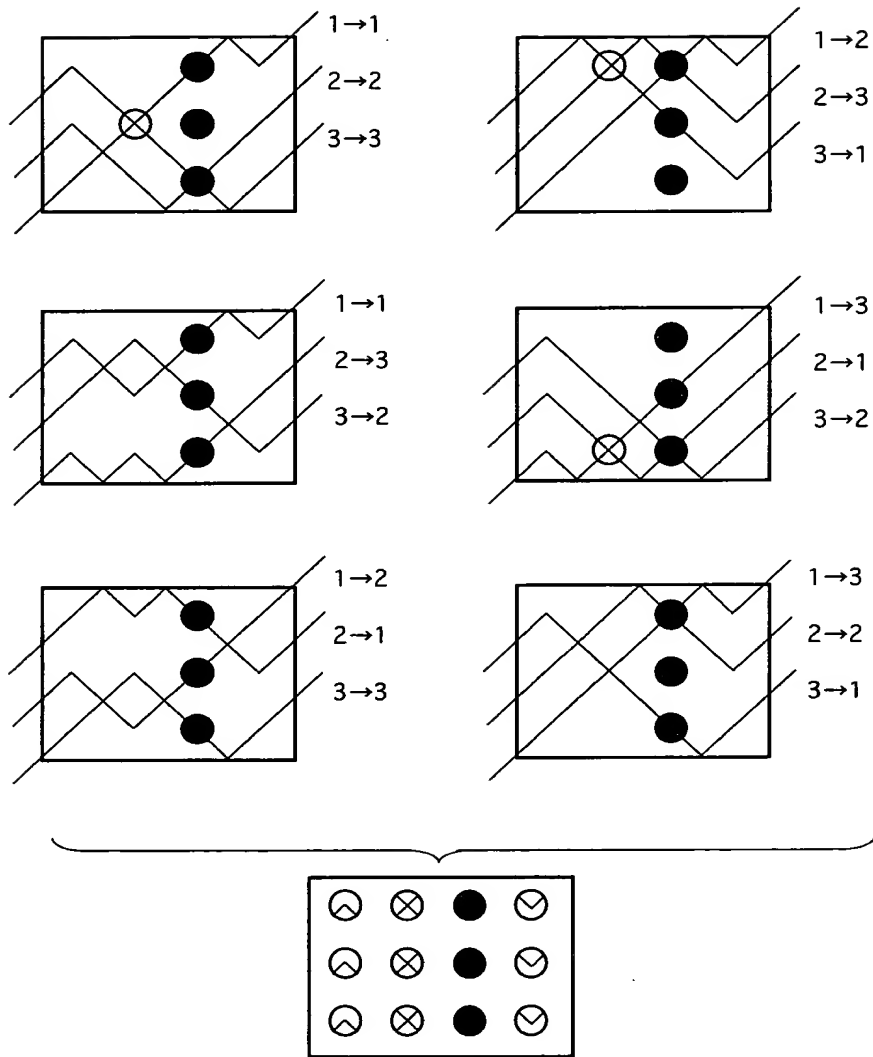
SIMULTANEOUS BIDIRECTIONAL REFLECTION; ONE CELL



SIMULTANEOUS BIDIRECTIONAL REFLECTION; ONE CELL



# FIG.20



⊗ SIMULTANEOUS BIDIRECTIONAL REFLECTION MIRROR

# FIG.21

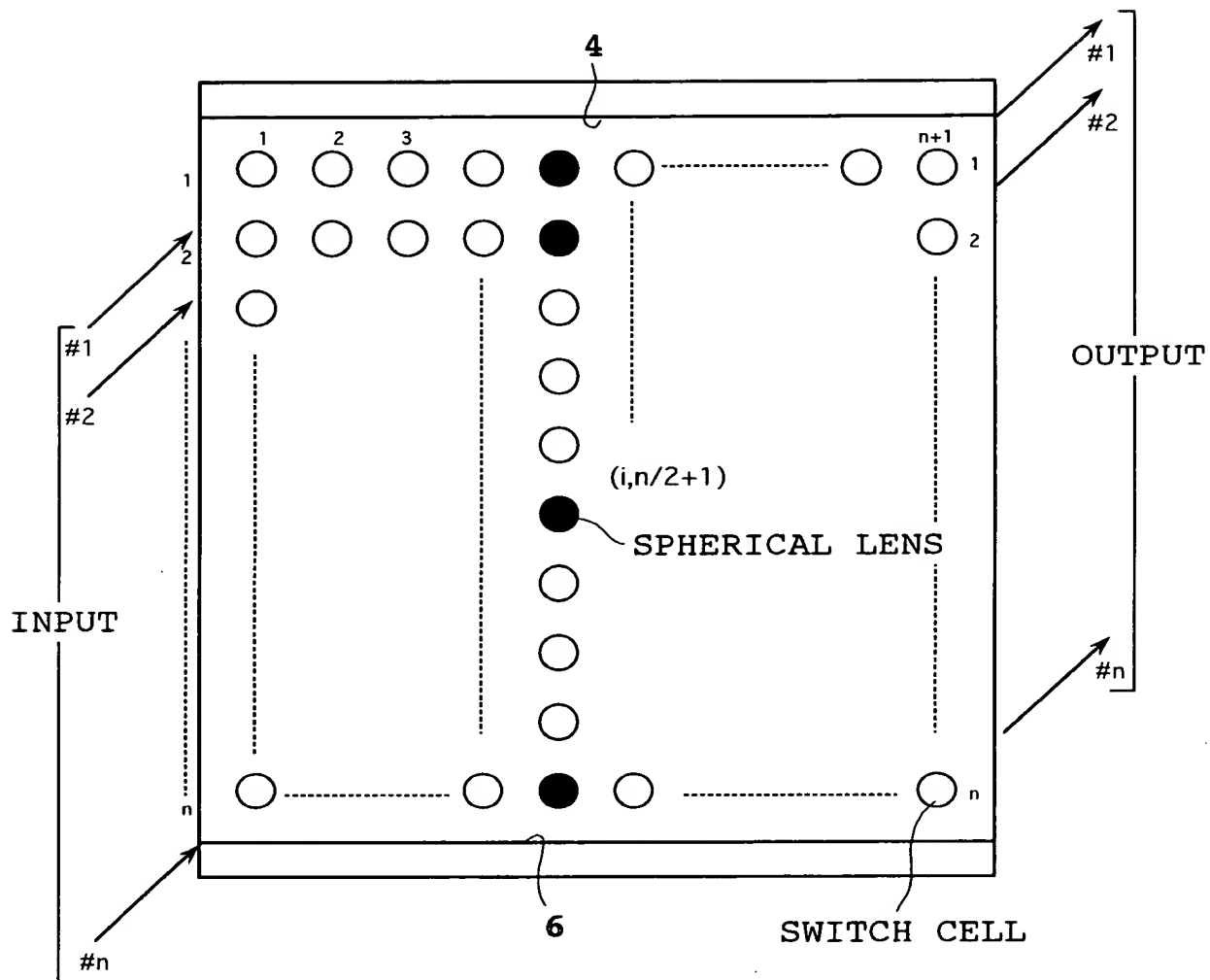


FIG. 21

FIG.22

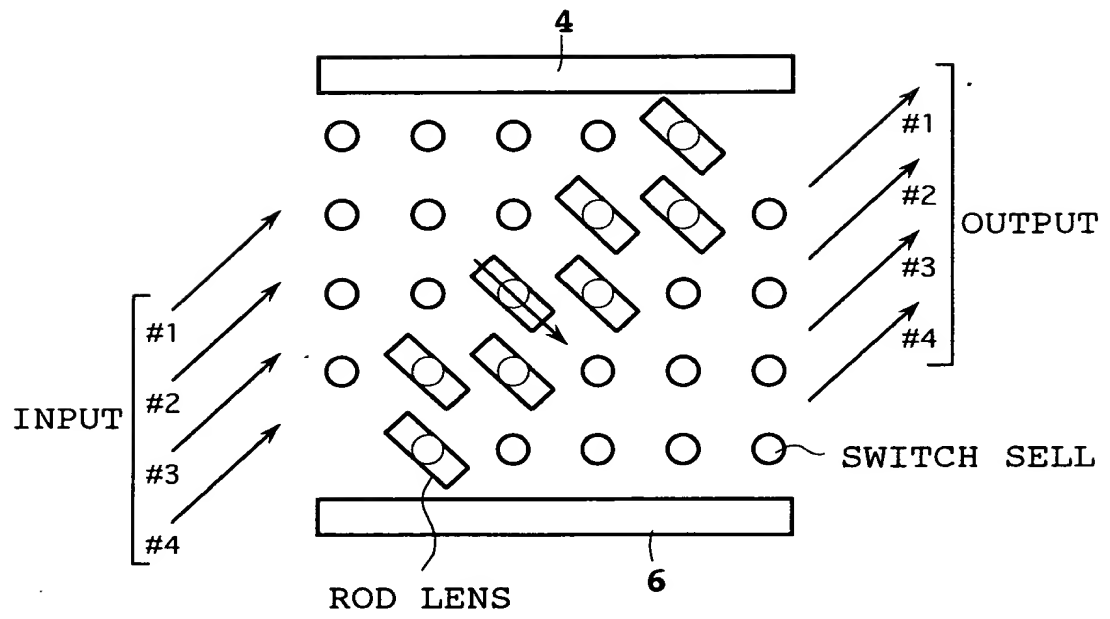
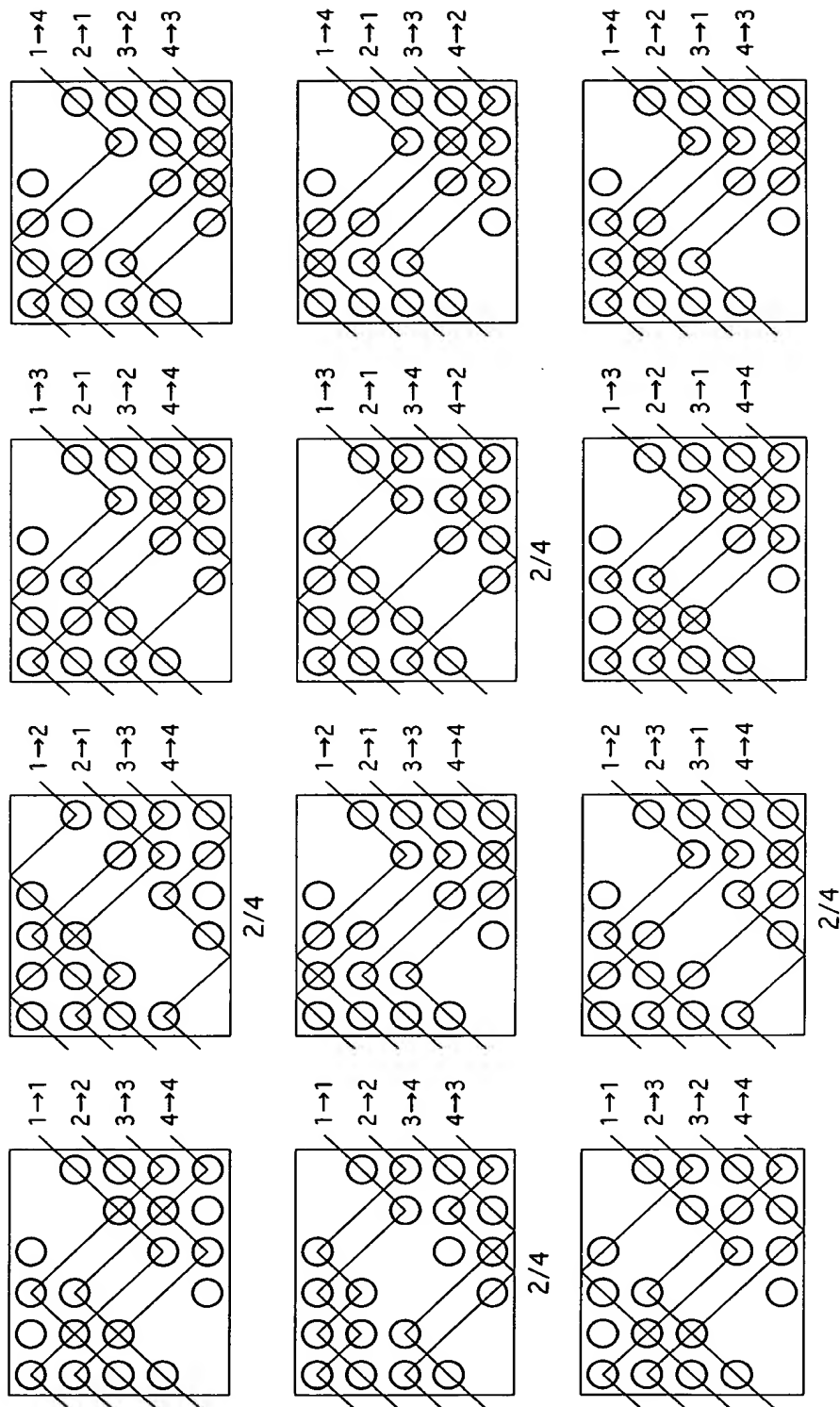
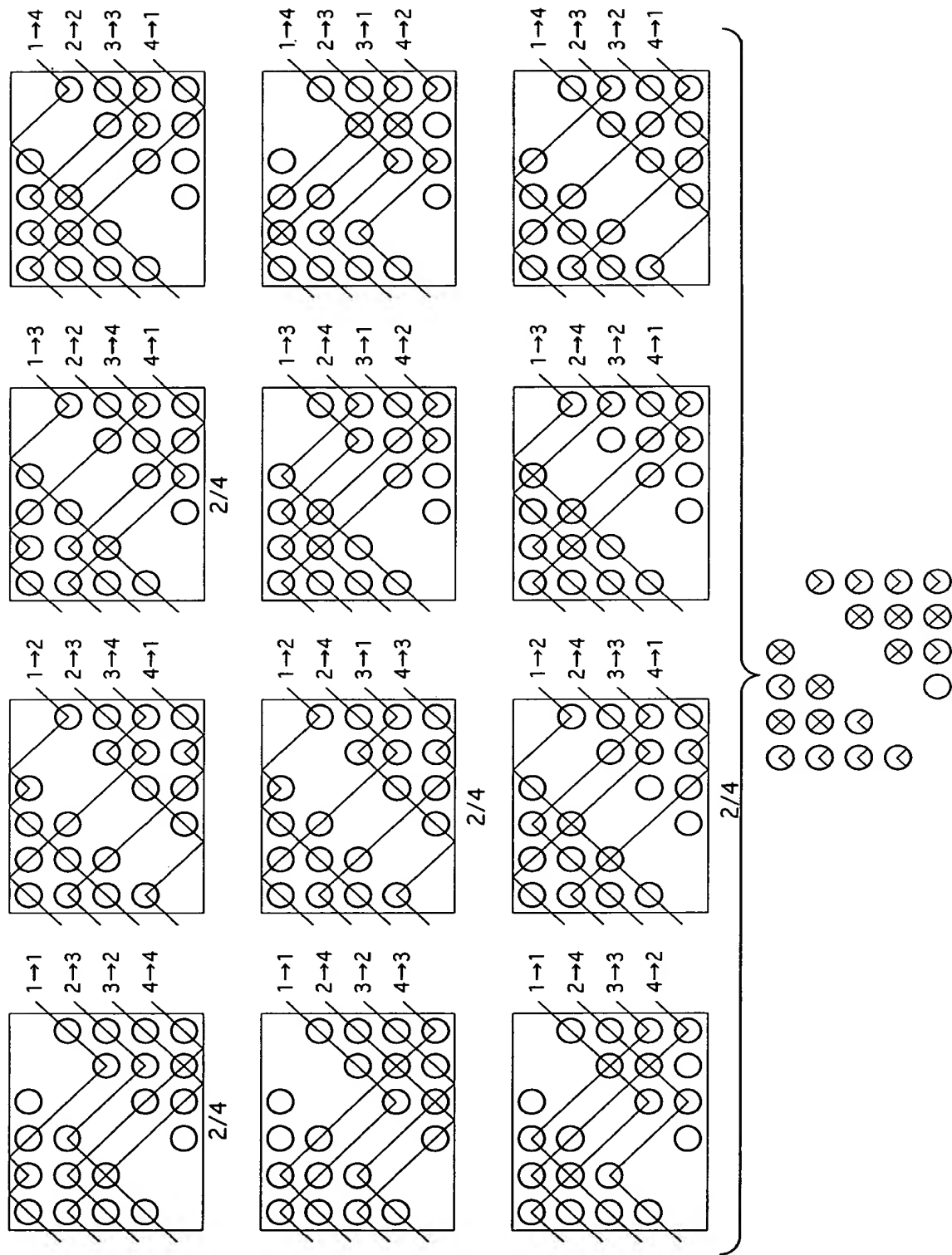


FIG.23





# FIG. 24



# FIG.25

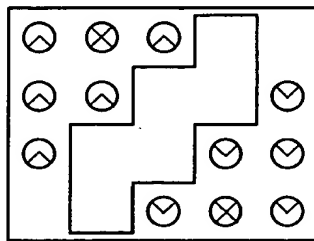
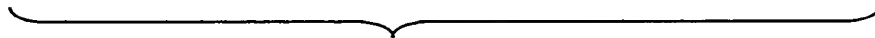
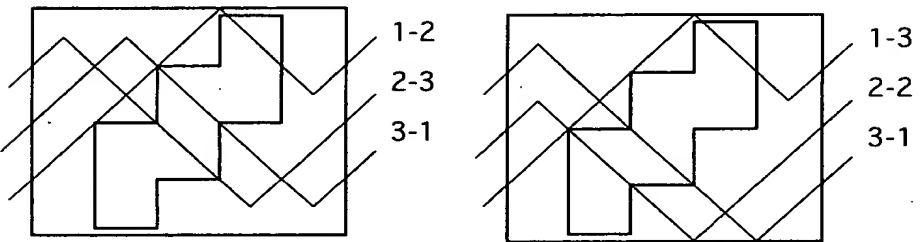
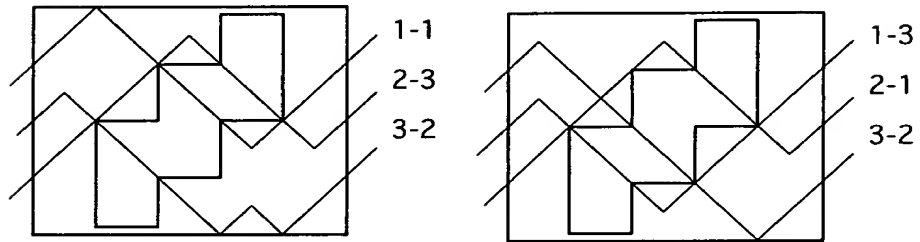
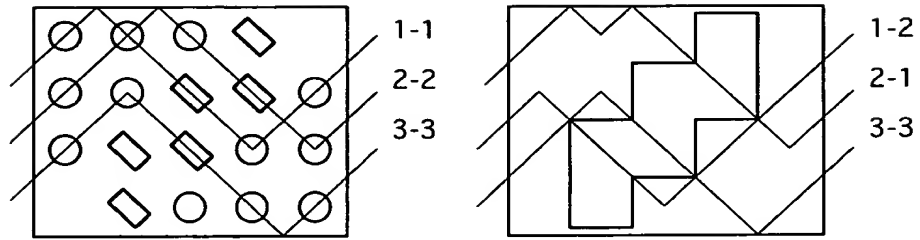
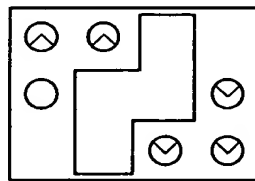
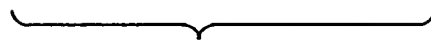
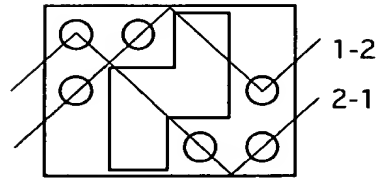
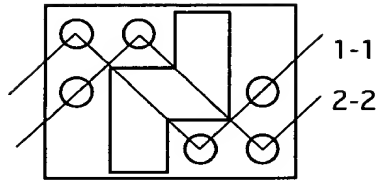
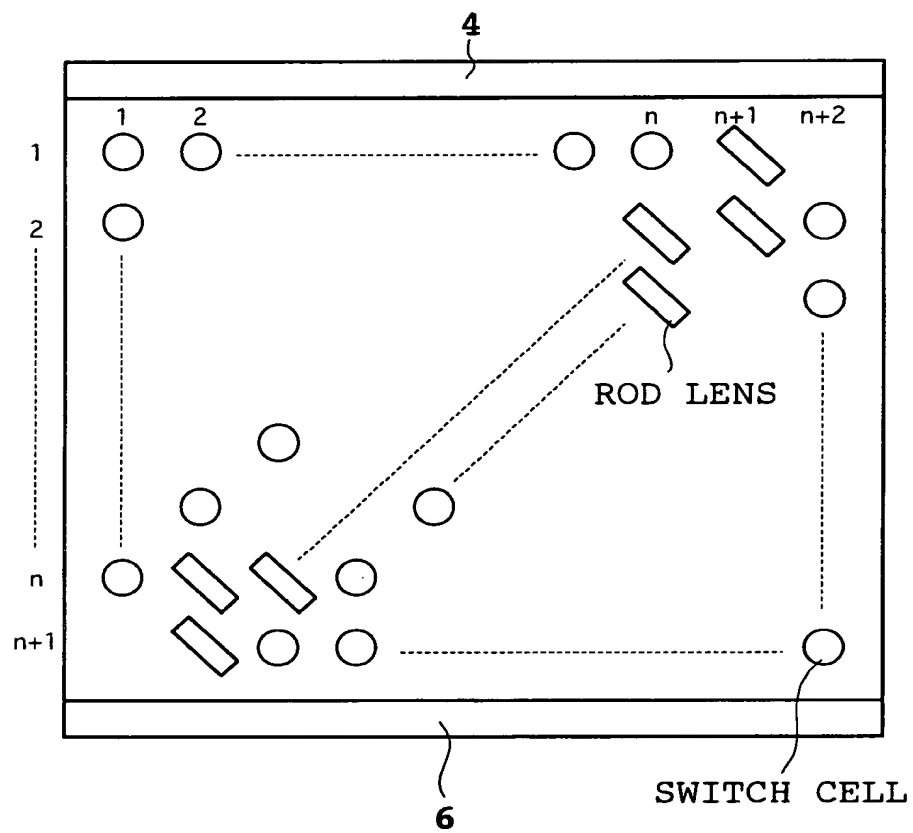


FIG.26

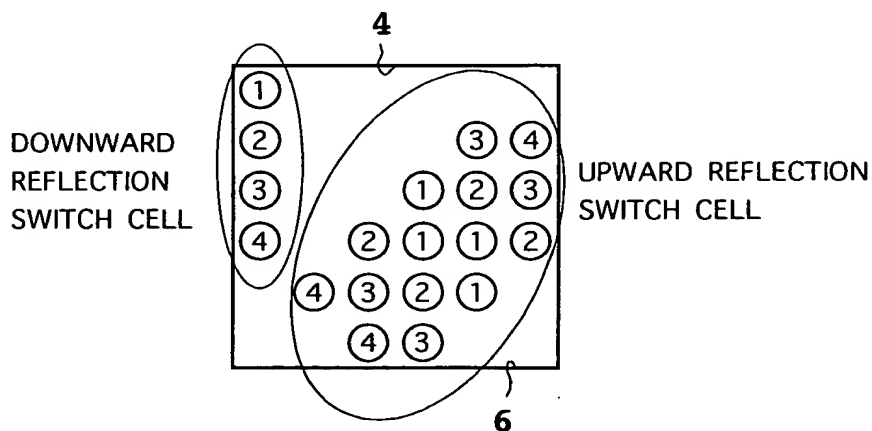
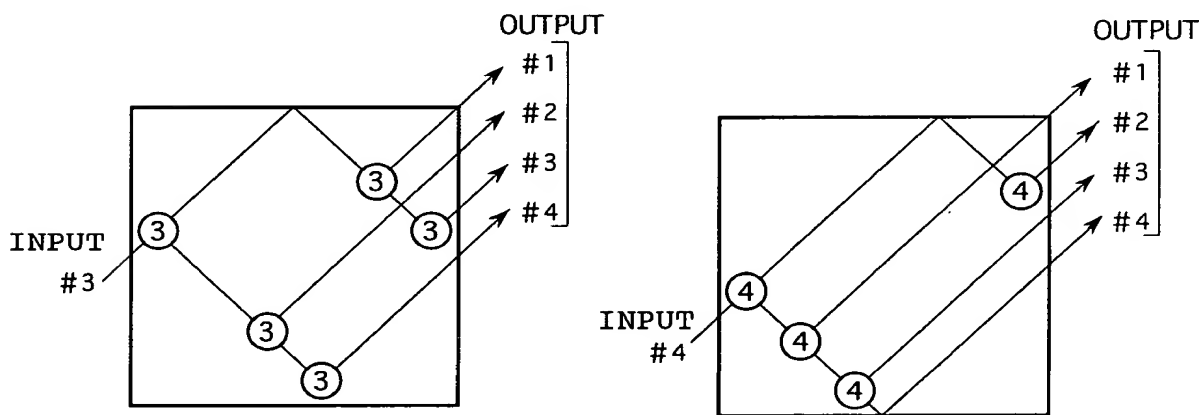
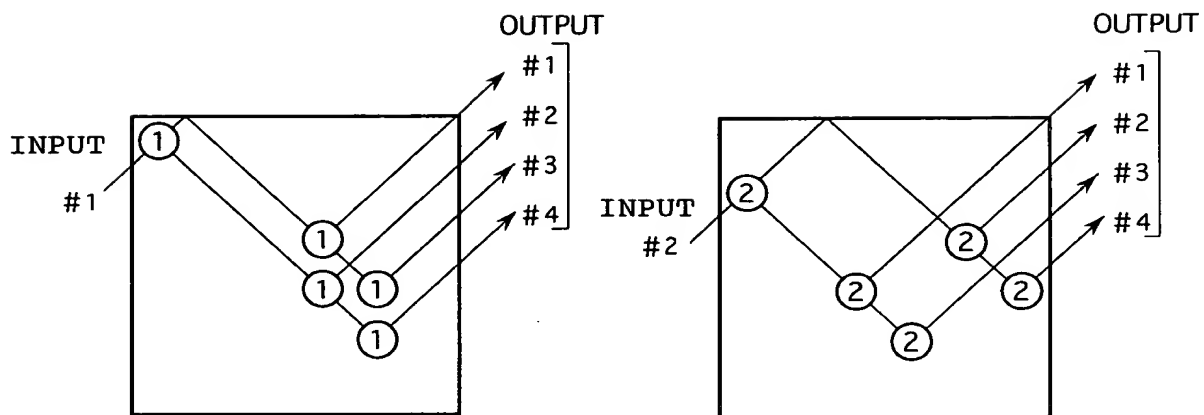


# FIG.27



TOP SECRET 90942660

# FIG.28



# FIG.29

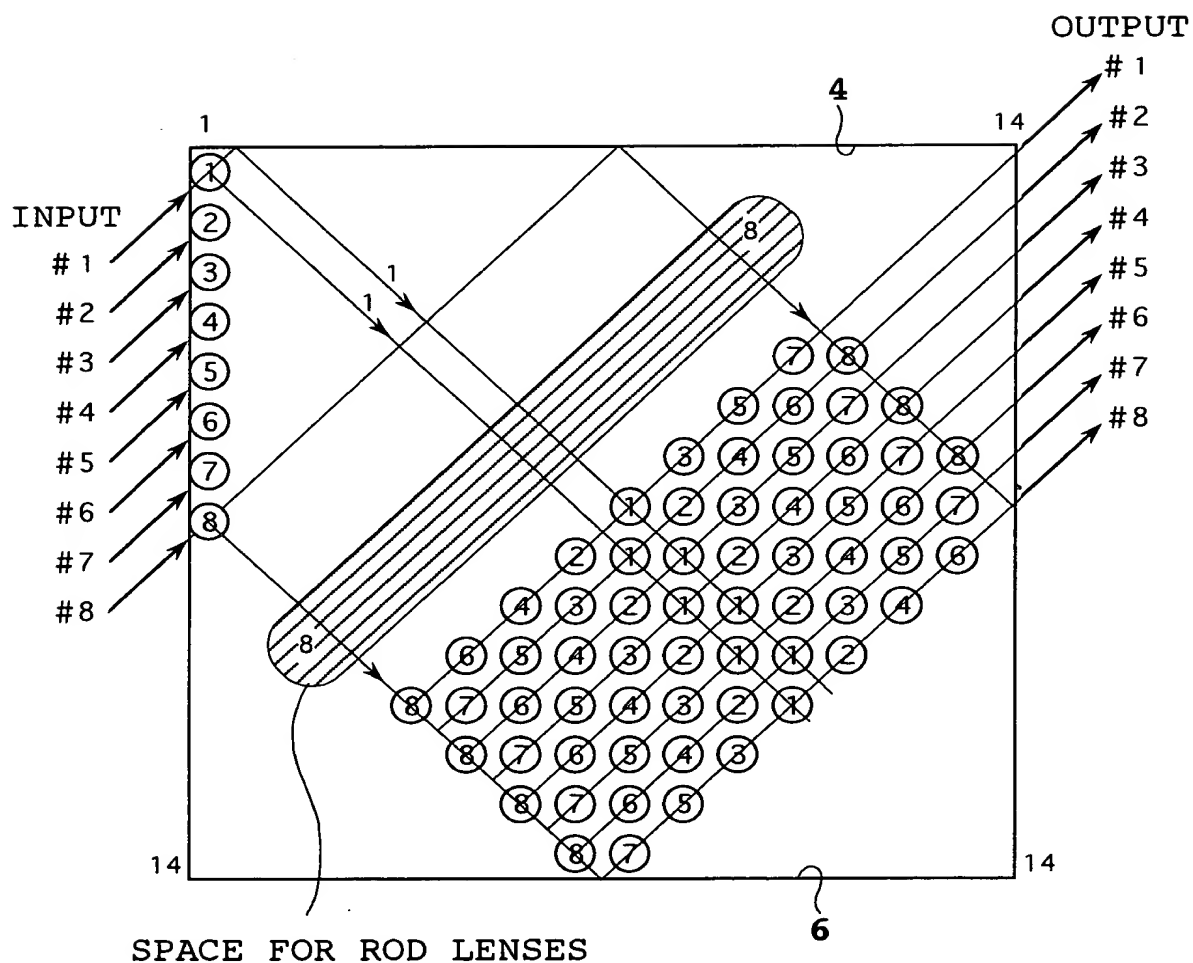
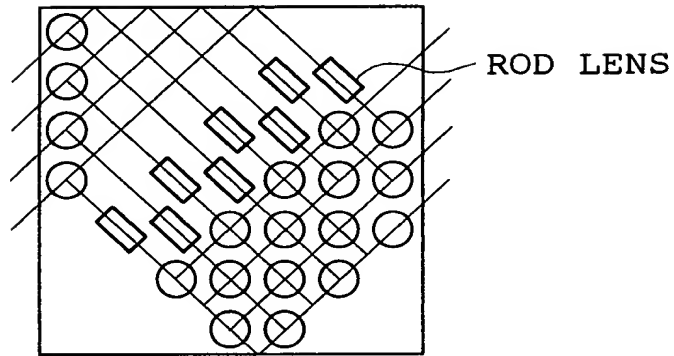
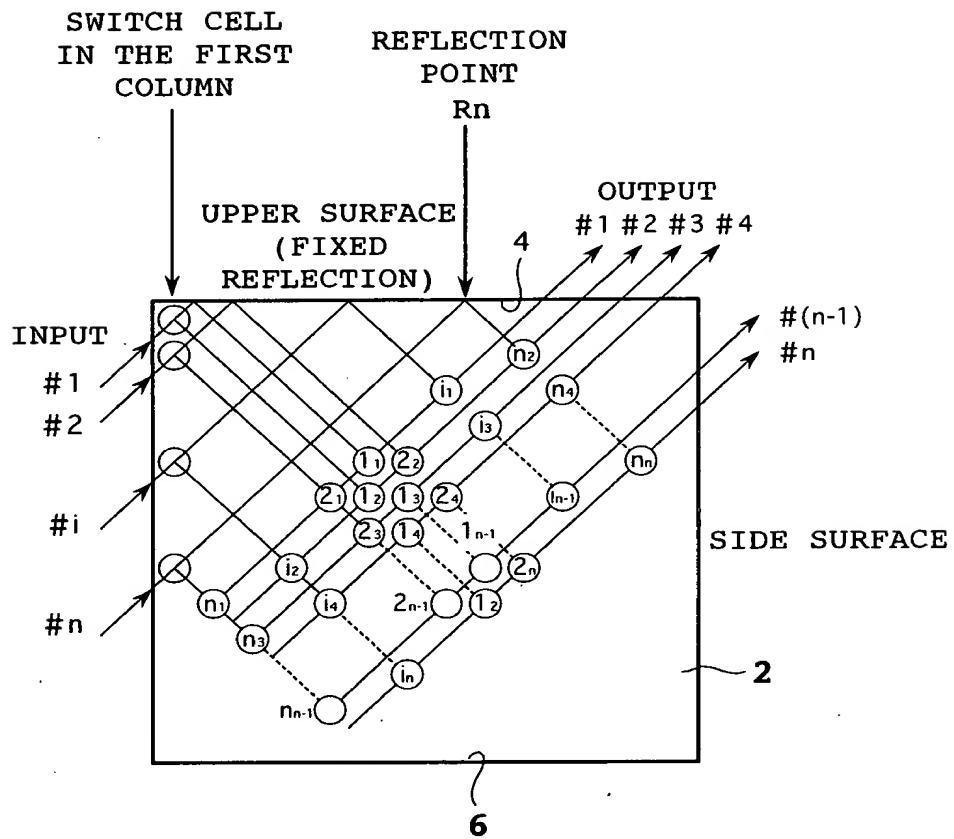


FIG.30



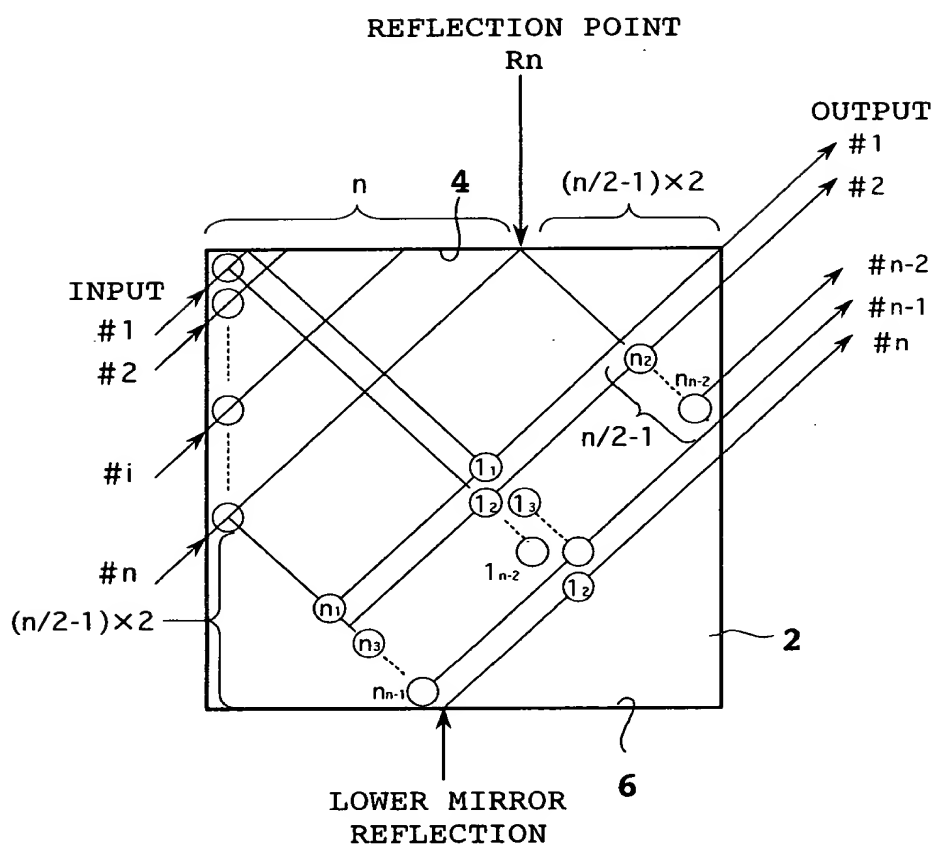
# FIG.31



①<sub>n</sub> : UPWARD REFLECTION SWITCH CELL FOR  
CONNECTING INPUT CHANNEL #i  
TO OUTPUT CHANNEL #n



# FIG.32



106080" 90942660

FIG. 33

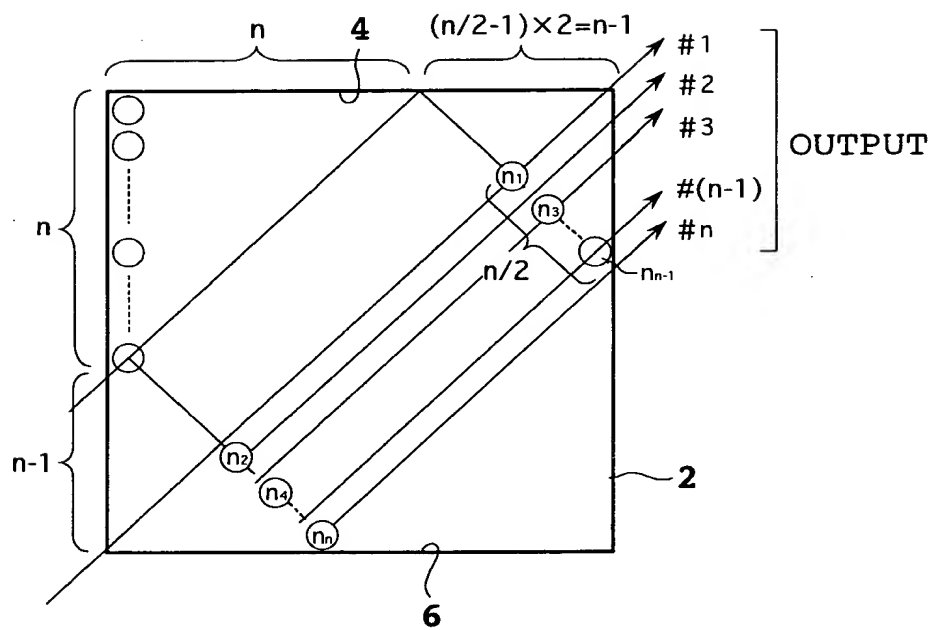
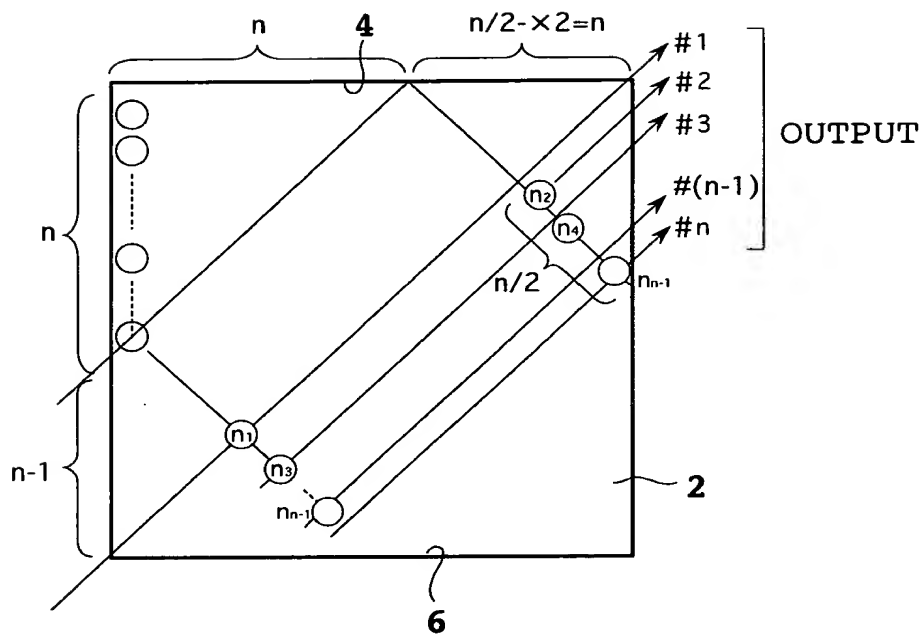


FIG. 34



# FIG.35

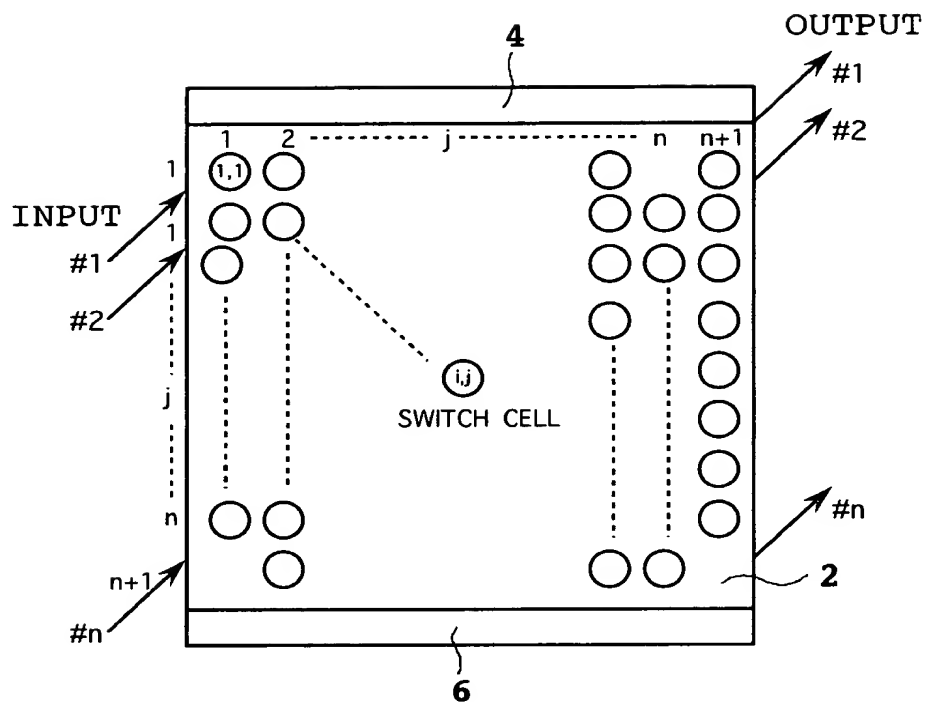
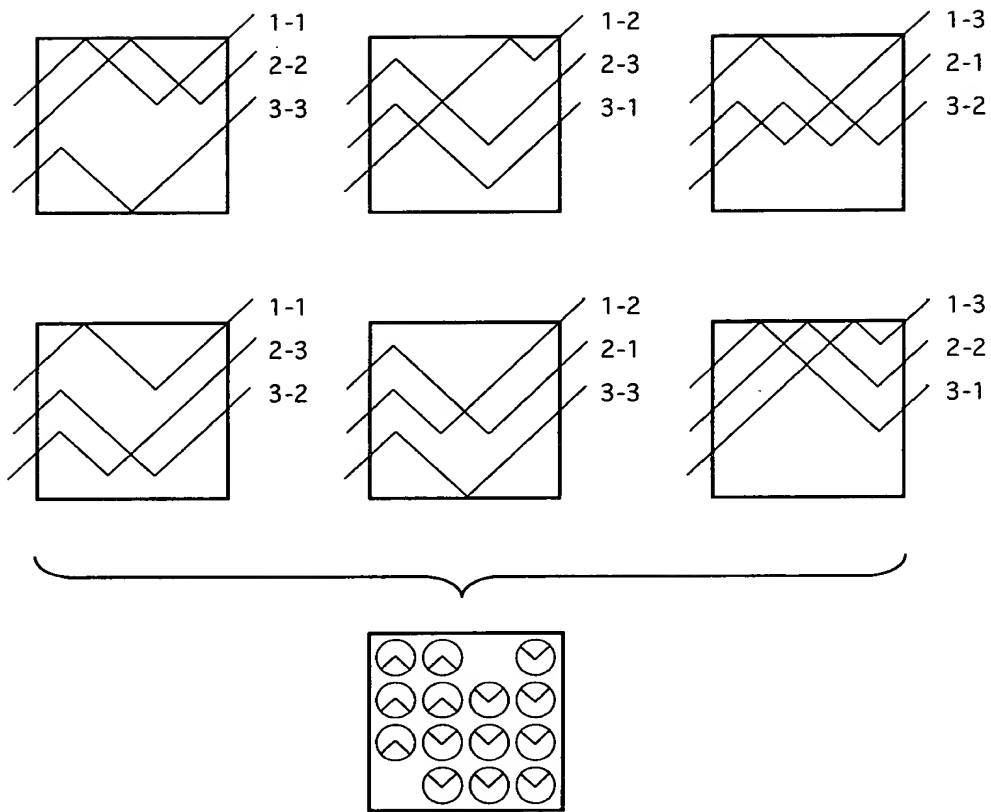
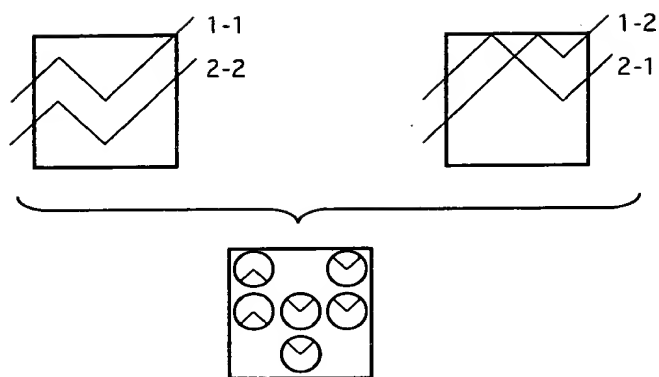


FIG.36



# FIG.37



## 2 x 2 OPTICAL SWITCH

SIZE; 3 x 3

OPTICAL PATH LENGTH; 3

NUMBER OF CELLS; 6

NUMBER OF UPWARD REFLECTION MIRRORS; 4

NUMBER OF DOWNWARD REFLECTION MIRRORS; 2

NUMBER OF REFLECTIONS ; ALWAYS 2

FIG.38

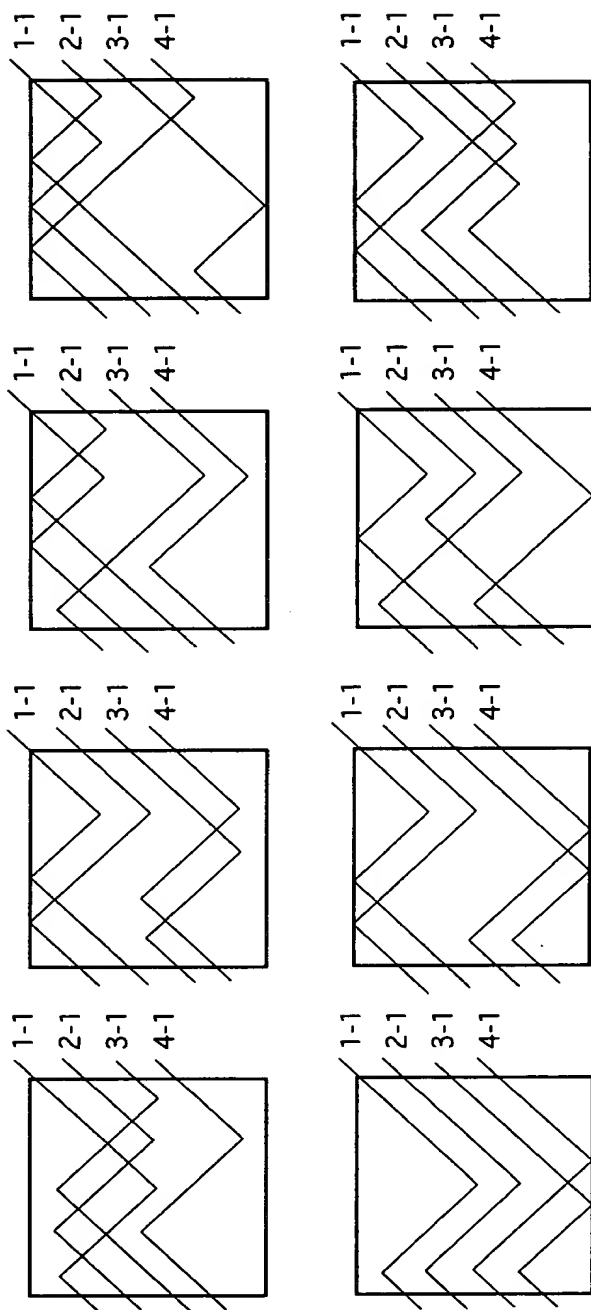


FIG. 39

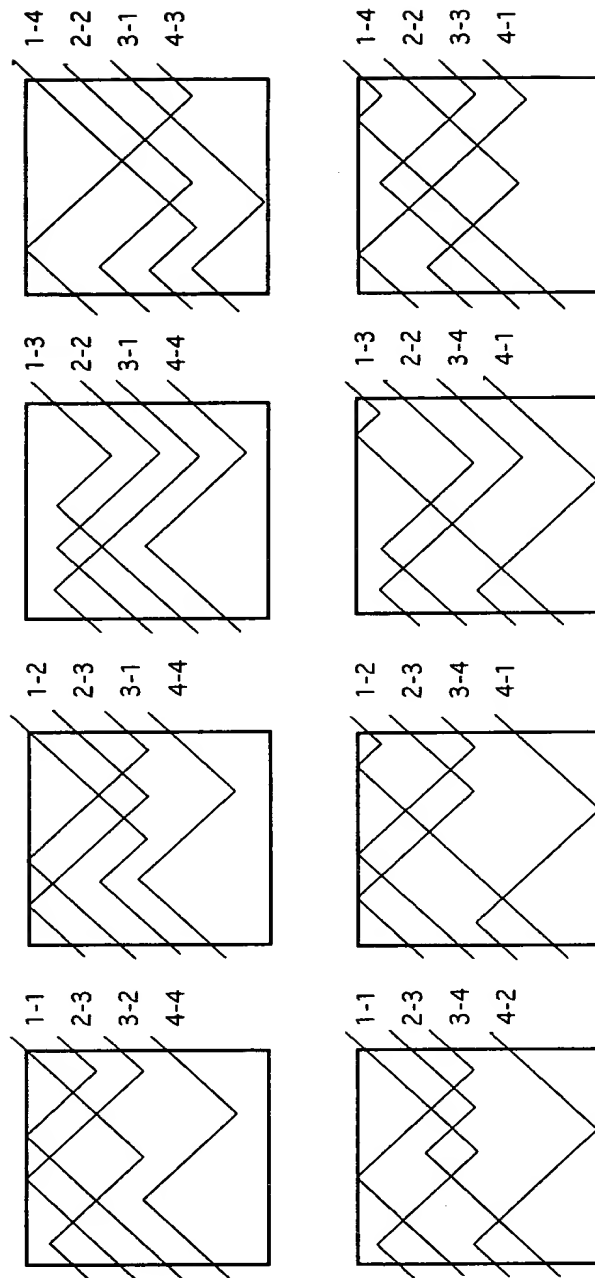




FIG. 40

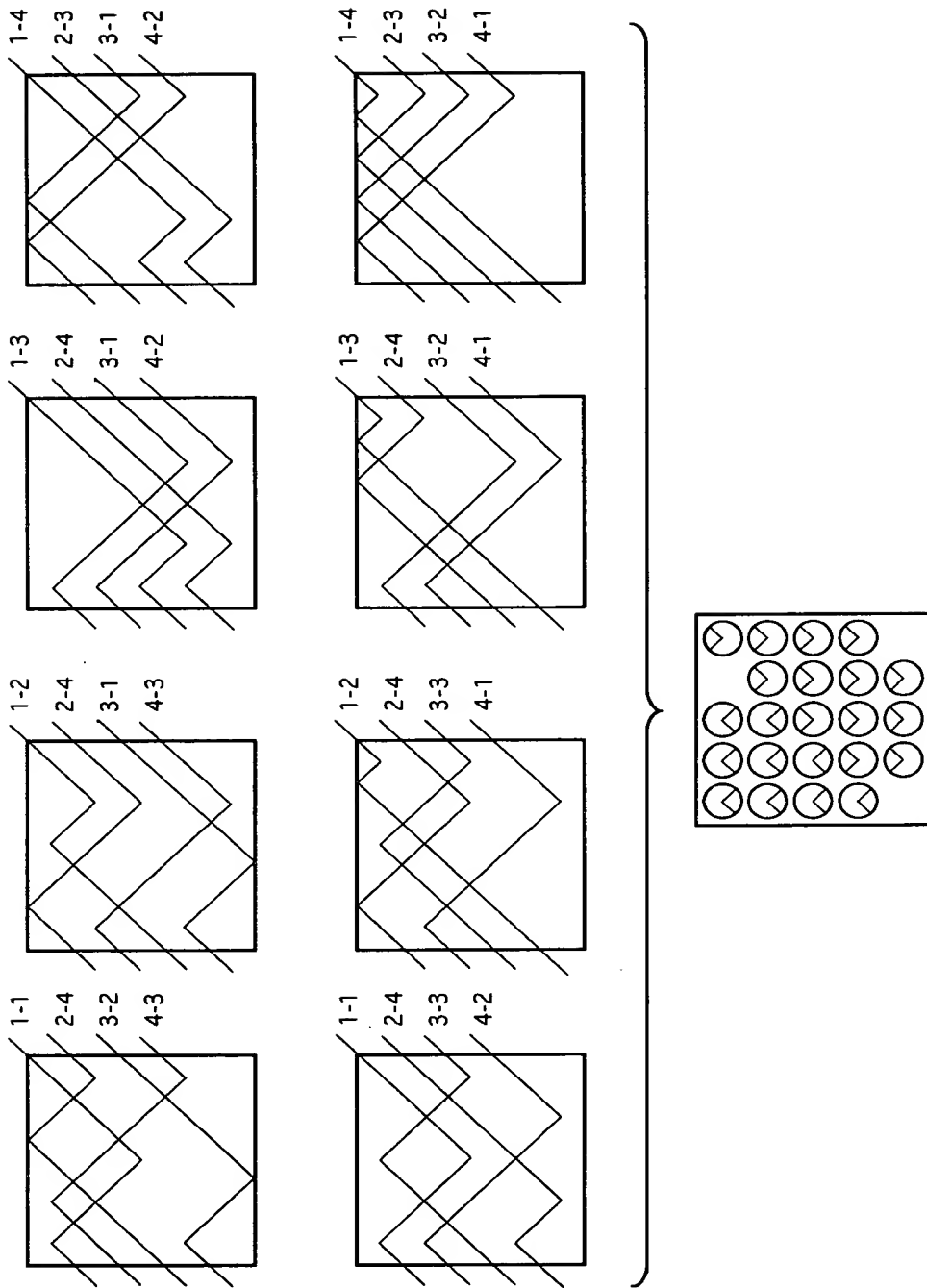


FIG.41

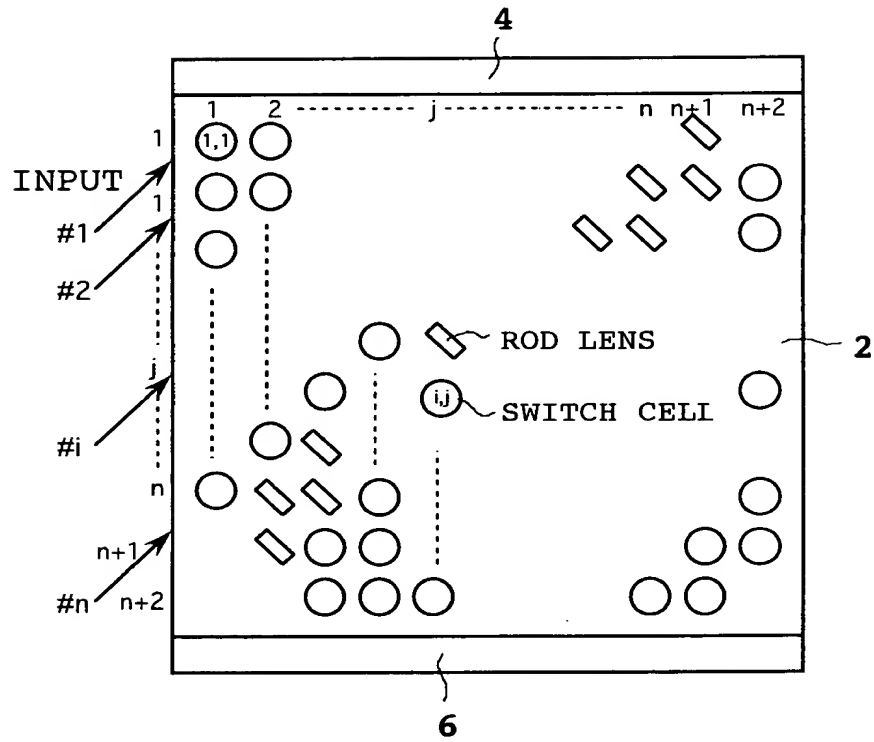


FIG.42

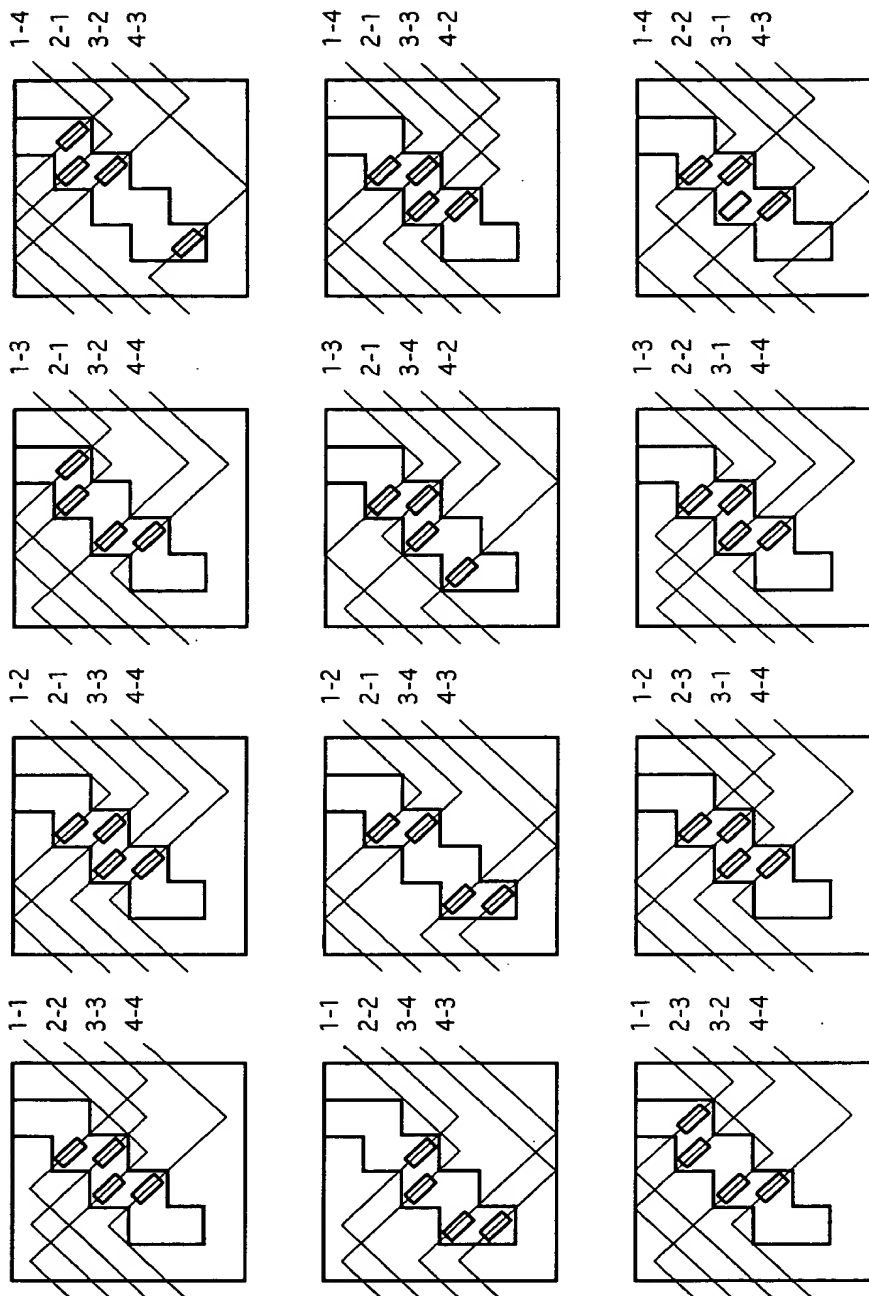
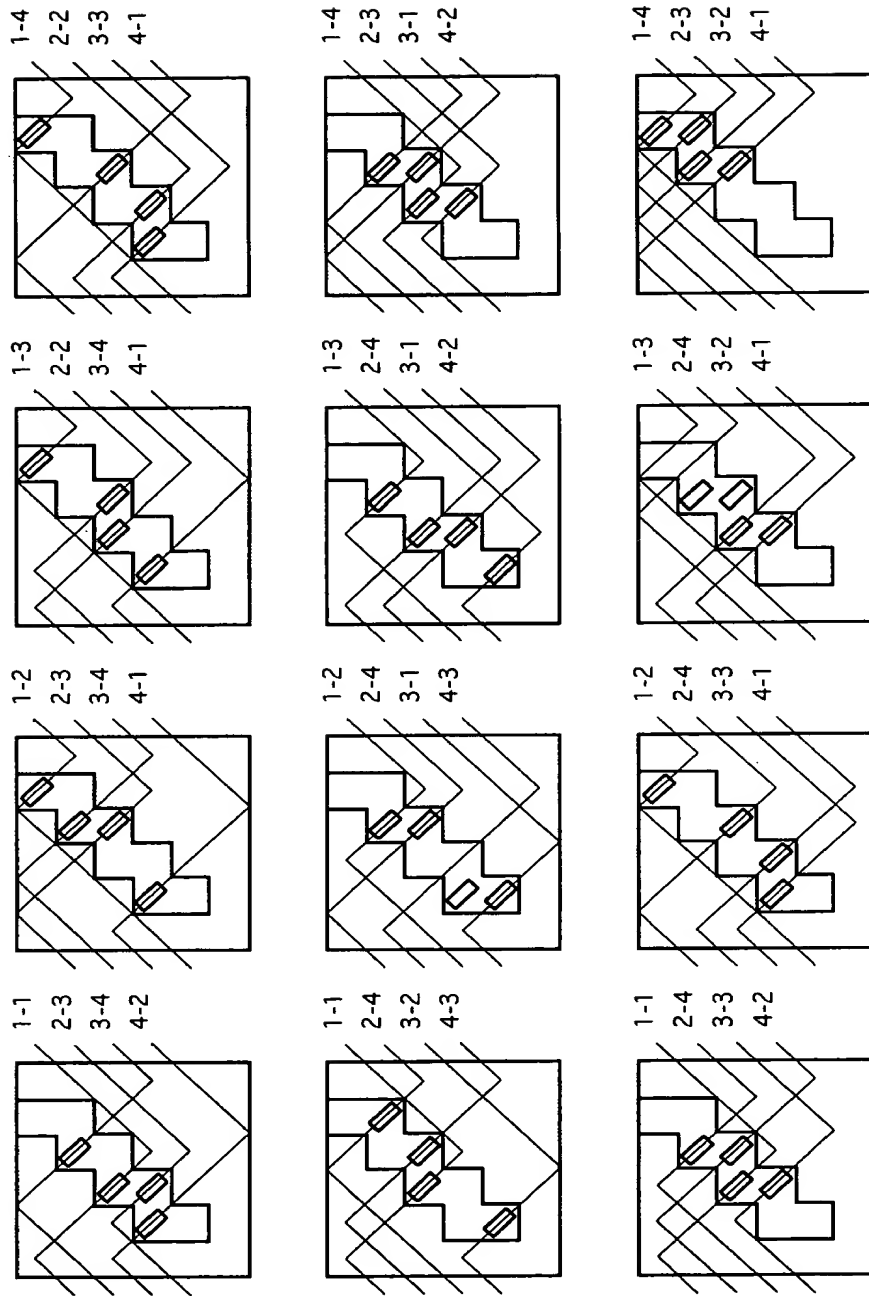
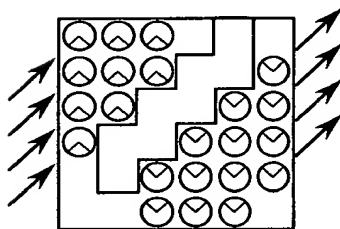
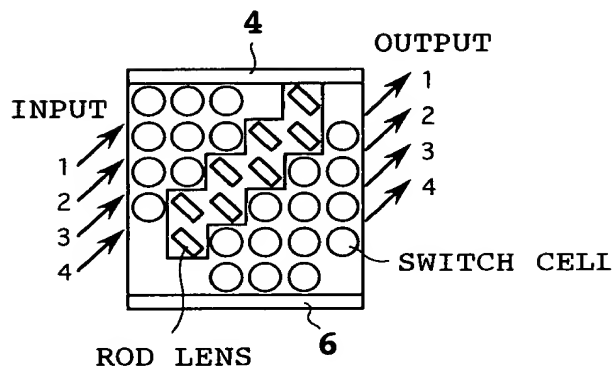


FIG.43

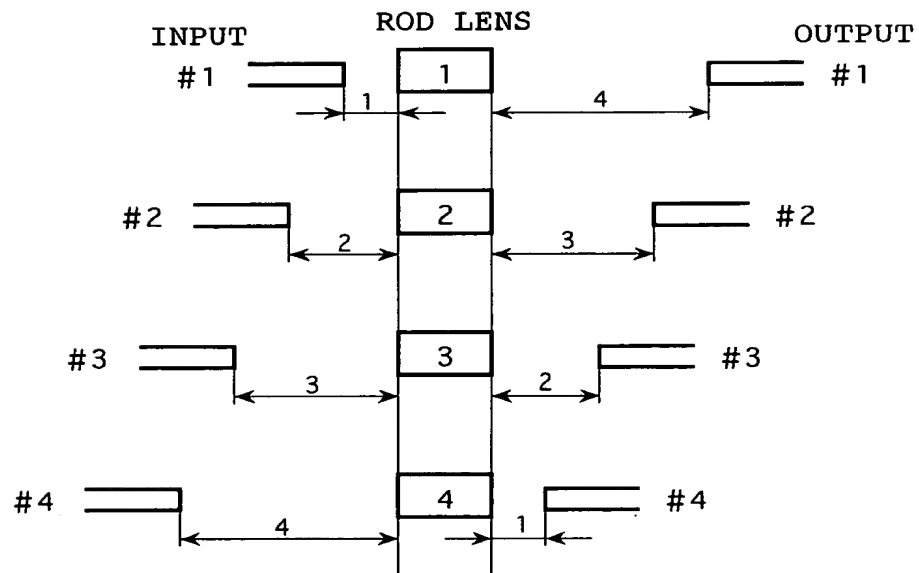
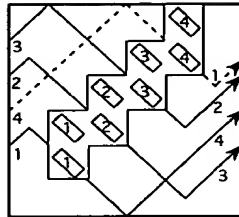


106080" 90342650

FIG.44

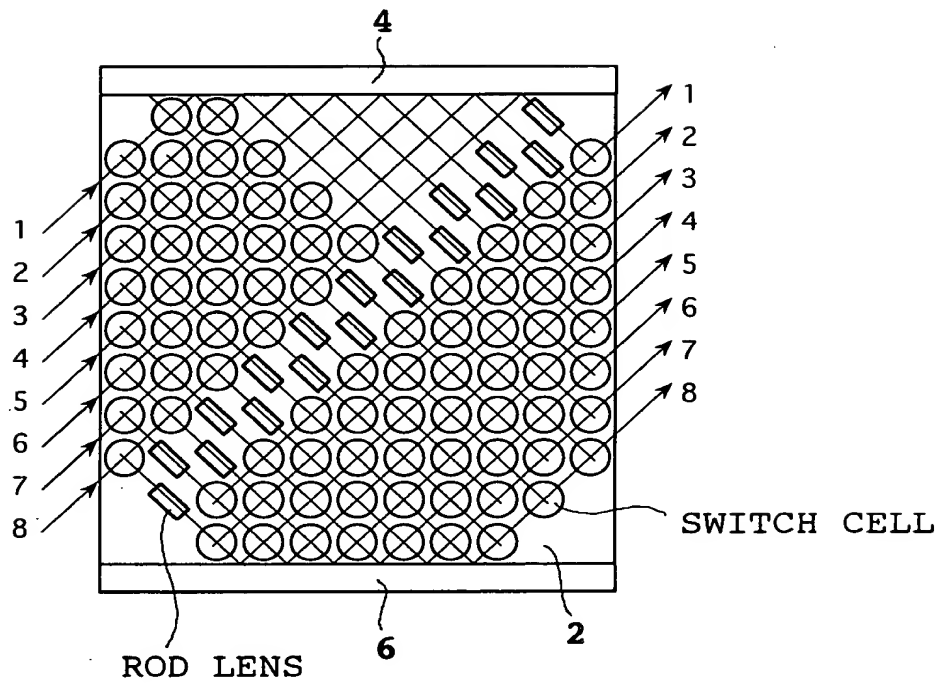


# FIG.45



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FIG.46



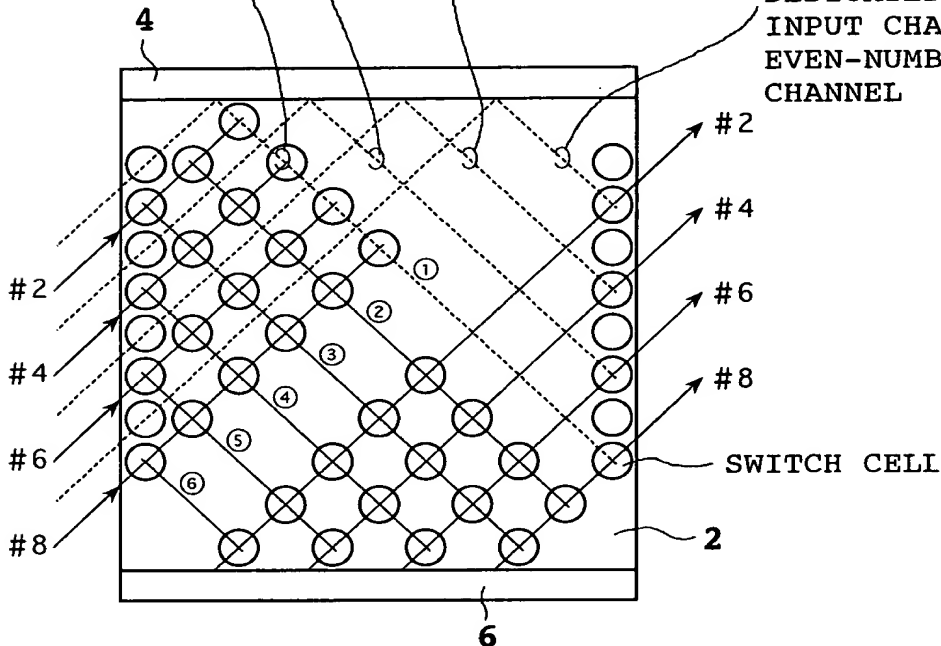
# FIG.47

DEDICATED ROUTE FROM INPUT  
CHANNEL #1 TO EVEN-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM INPUT  
CHANNEL #3 TO EVEN-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM INPUT  
CHANNEL #5 TO EVEN-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM  
INPUT CHANNEL #7 TO  
EVEN-NUMBERED OUTPUT  
CHANNEL



- ①, ②, ③ : ROUTES TO OUTPUT CHANNELS  
#2, #4, #6, AND #8
- ④ : ROUTES TO OUTPUT CHANNELS  
#2, #4, AND #6
- ⑤ : ROUTES TO OUTPUT CHANNELS  
#2, AND #4
- ⑥ : ROUTES TO OUTPUT CHANNELS  
#2

INPUT CHANNEL	ROUTE TO EVEN-NUMBERED OUTPUT CHANNEL
2	①/②/③
4	①/②/③, ④
6	①/②/③, ④, ⑤
8	①/②/③, ④, ⑤, ⑥

INPUT CHANNEL	OUTPUT CHANNEL	ROUTE
2 →	2	① or ② or ③
4 →	4	① or ② or ③
6 →	6	④
8 →	8	① or ② or ③



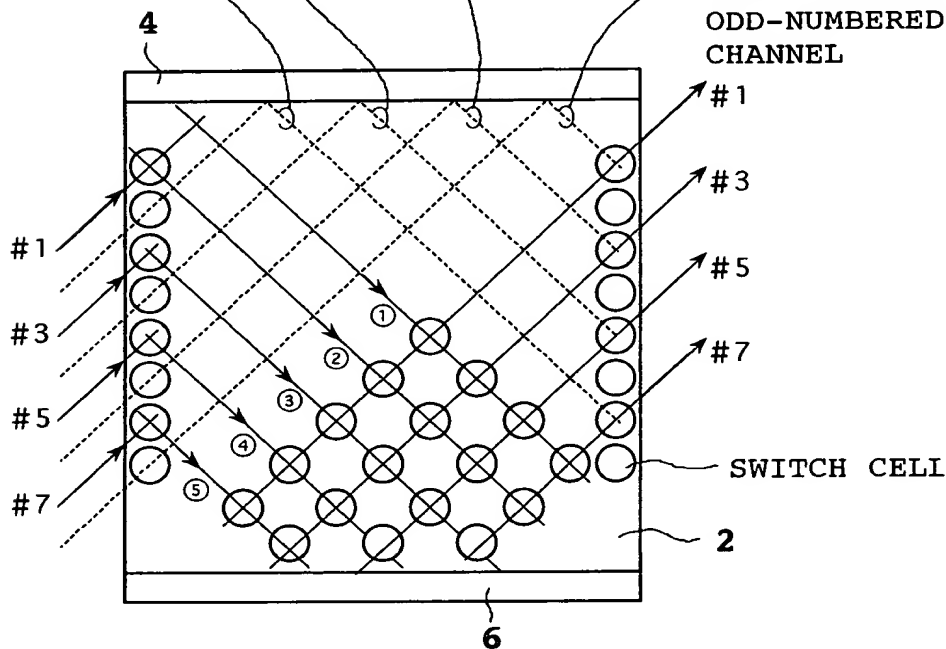
# FIG.48

DEDICATED ROUTE FROM INPUT CHANNEL  
#2 TO ODD-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM INPUT CHANNEL  
#4 TO ODD-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM INPUT CHANNEL  
#6 TO ODD-NUMBERED OUTPUT CHANNEL

DEDICATED ROUTE FROM  
INPUT CHANNEL #8 TO  
ODD-NUMBERED OUTPUT  
CHANNEL



①, ② : ROUTES TO OUTPUT CHANNELS  
#1, #3, #5, AND #7

③ : ROUTES TO OUTPUT CHANNELS  
#1, #3, #5 AND #7 WHEN  
INPUT CHANNEL IS #3, #5, OR  
#7

④ : ROUTES TO OUTPUT CHANNELS  
#1, #3, AND #5

⑤ : ROUTES TO OUTPUT CHANNELS  
#1 AND #3

INPUT CHANNEL	ROUTE TO ODD-NUMBERED OUTPUT CHANNEL
1	①/②
3	①/②, ③
5	①/②, ③, ④
7	①/②, ③, ④, ⑤

INPUT CHANNEL	OUTPUT CHANNEL	ROUTE
1 →	1	① or ②
3 →	3	③
5 →	5	④
7 →	7	① or ②

# FIG.49

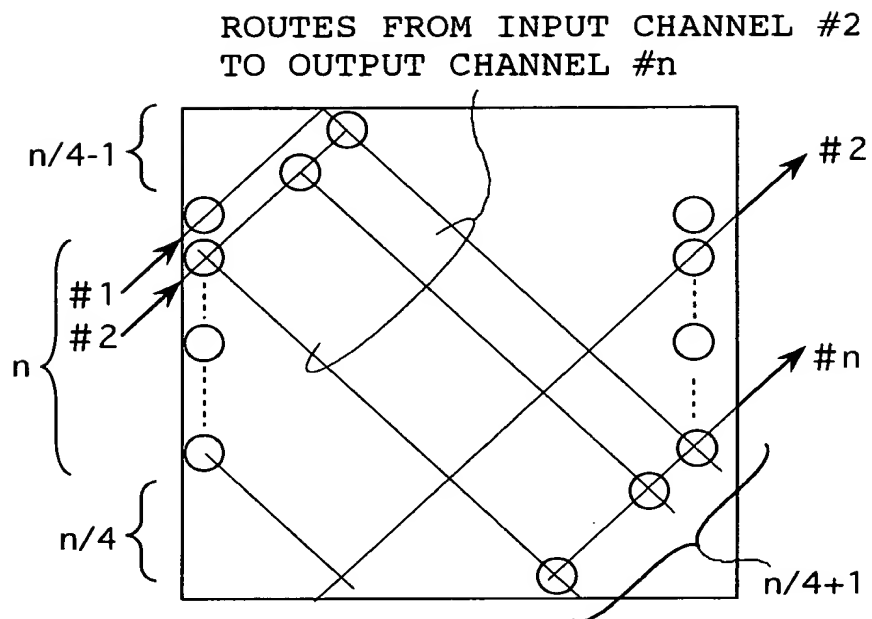
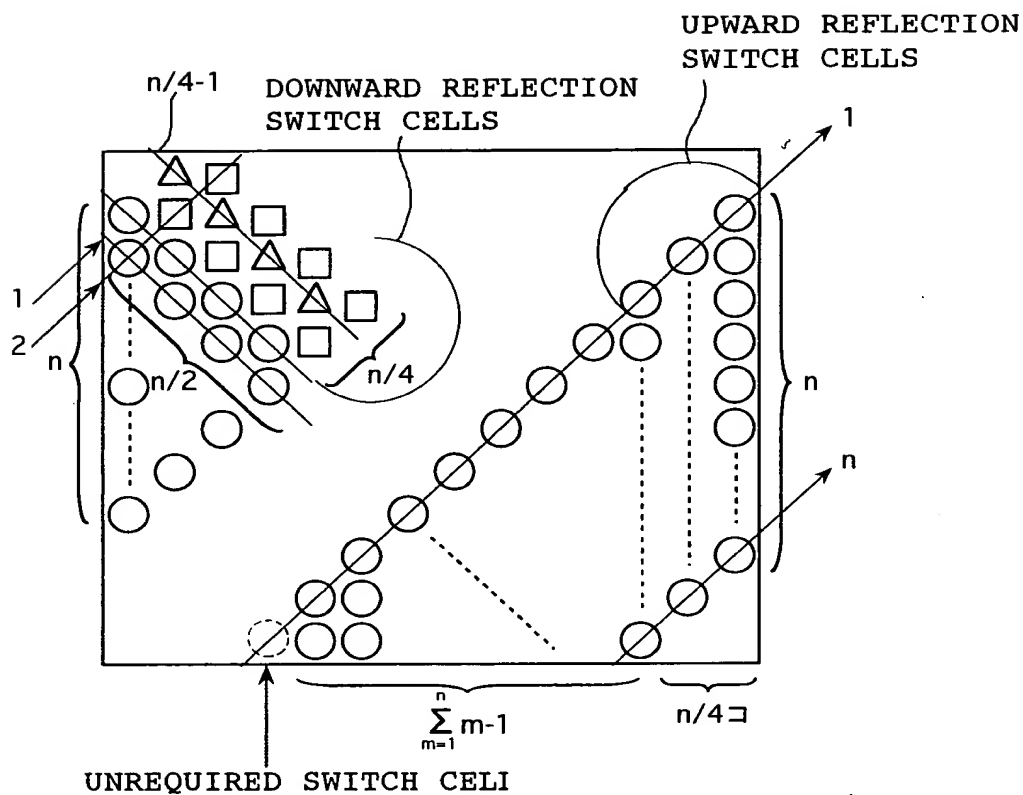




FIG. 50





$$\text{NUMBER OF UPWARD REFLECTION SWITCH CELLS} : \sum_{m=1}^n m-1 + \frac{n}{4} \times n = \frac{n(n+1)}{2} - 1 + \frac{n^2}{4} = \frac{3}{4} n^2 + \frac{1}{2} n - 1$$


NUMBER OF DOWNWARD :  $2 \cdot \sum_{m=1}^{n/2} m + \frac{n}{4} \times \frac{n}{2} + \left( \frac{n}{4} - 1 \right) \times \frac{n}{2} = \frac{n^2}{2}$   
 REFLECTION  
 SWITCH CELLS







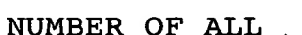


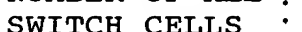









































































































$$\begin{array}{l} \text{NUMBER OF ALL} : \frac{5}{4} n^2 + \frac{1}{2} n - 1 \\ \text{SWITCH CELLS} : \end{array}$$

FIG.51

